
5.1

WAC 463-60-536 Air emissions permits and authorizations.

(1) The application for site certification shall include a completed prevention of significant deterioration permit (PSD) application and a notice of construction application pursuant to the requirements of chapter 463-78 WAC.

(2) The application shall include requests for authorization for any emissions otherwise regulated by local air agencies as identified in WAC 463-60-297 Pertinent federal, state and local requirements.

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SECTION 5.1 AIR EMISSIONS PERMITS AND AUTHORIZATIONS (WAC 463-60-536)

5.1.1 INTRODUCTION

Energy Northwest proposes to construct the Pacific Mountain Energy Center (PMEC), an Integrated Gasification Combined Cycle (IGCC) development, at the Port of Kalama, WA. The PMEC would gasify petcoke and/or coal to create synthesis gas or syngas to power two combined cycle combustion turbine electric power generating plants.

The Energy Facility Site Evaluation Council (EFSEC) is the lead state agency responsible for environmental permitting of energy facilities with a capacity of greater than 350 megawatt (MW). EFSEC has responsibility for technical review of air quality concerns and for administering the Prevention of Significant Deterioration (PSD) program, however, review is conducted by assigned staff at the Washington Department of Ecology (Ecology). The United States Environmental Protection Agency (USEPA) co-signs the PSD permit.

Under Washington Administrative Code (WAC) 463-78-005, EFSEC has adopted by reference the general air quality regulations Ecology has established in Chapters 173-400, 173-401, 173-406, and 173-460 WAC. Although authority is delegated to EFSEC, this section cites the Ecology regulations to provide specific reference to the PSD permit requirement. It should also be noted that regulations established by the Southwest Clean Air Agency (SWCAA) do not, strictly speaking, apply to the PMEC. However, SWCAA regulations are noted in the discussion of applicable regulations

5.1.1.1 Organization

This section constitutes a combined Notice of Construction (NOC) and PSD permit application. The requested PSD permit would address criteria pollutants emitted in significant quantities (defined in the federal PSD program). The NOC permit would address Toxic Air Pollutants (TAPs) and other criteria pollutants emitted in quantities below the PSD significant quantities.

Key components of the PSD permit application are as follows:

- An air quality permit application typically begins with a project description. However, this permit application is a component of a broader Application for Site Certification (Application). Section 2.3, Construction on Site, of this document provides a project description.
- Section 5.1.2 identifies applicable air quality regulations, summarizes the emissions limits proposed based upon the Best Available Control Technology (BACT) analysis, and identifies air pollutant emissions. A more detail presentation of BACT is included in the BACT analysis report (Appendix B-1 of this Application).
- Section 5.1.3 describes the local air quality impacts analysis used to estimate concentrations of criteria pollutants and TAPs in the vicinity of the project (i.e., Class II areas), presents concentrations calculated with dispersion models, and compares the calculations with regulatory criteria.

- Section 5.1.4 presents PMEC's impact on regional air quality related values, including visibility and acid deposition in national parks and wilderness areas (i.e. Class I areas), and additional impacts analysis related to growth.
- References are provided in Section 1.5, Sources of Information, of this Application.

5.1.1.2 Summary of Findings

The air quality impact assessment that follows indicates:

- Predicted maximum concentrations of criteria pollutants resulting from PMEC emissions are less than USEPA's Significant Impact Levels (SILs) and are small fractions of the Class I and Class II increments established by the PSD program.
- Total air pollutant concentrations are less than the National and Washington Ambient Air Quality Standards (NAAQS and WAAQS) established to protect human health and welfare when the maximum predicted concentrations are added to the existing background concentrations
- Predicted concentrations of TAPs potentially released from the PMEC are below Ecology's Small Quantity Emissions Rates (SQER) or Ecology's Acceptable Source Impact Levels (ASIL) for all pollutants.
- Sulfur dioxide (SO₂) and nitrogen oxides (NO₂) concentrations in Class I areas attributable to the PMEC are small fractions of United States Department of Agriculture Forest Service (USDA Forest Service) recommended levels for the protection of sensitive vegetation.
- Depositions of secondary aerosols from the facility are less than USDA Forest Service criteria for significant impacts to soils in these areas. Based on USDA Forest Service criteria, acidification of aquatic resources is not expected.
- Secondary aerosols potentially formed by emissions from the PMEC would not affect regional visibility in Class I areas even on the clearest days.

5.1.2 EMISSIONS

This section discusses federal, state, and local air quality regulations and guidelines that apply to the PMEC. It also identifies anticipated emission rates for criteria and TAPs associated with the combustion of syngas and natural gas. PMEC emissions are identified for several short-term operating scenarios and the anticipated annual operating scenario. Additional detail regarding the selection of emission rates is available in the BACT analysis, which is included as Appendix B-1 of the Application.

5.1.2.1 Emission Standards

5.1.2.1.1 New Source Performance Standards

USEPA has established performance standards for a number of air pollution sources in 40 Code of Federal Regulation (CFR) Part 60. These New Source Performance Standards (NSPS)

represent a minimum level of control that is required on a new source. This section identifies those NSPS that apply to PMEC emission units, which include: the following NSPS standards under 40 CFR 60, Subparts Da, Db, Dc, Y and A. After adoption as described below the PMEC would also need to comply with 40 CFR 60, Subpart HHHH.

5.1.2.1.1.1 Subpart KKKK, Standards of Performance for Stationary Combustion Turbines

Subpart KKKK establishes emission standards and compliance schedules for the control of emissions from stationary combustion turbines that combust more than 10 million British thermal units per hour (MMBtu/hr) and commenced construction, modification or reconstruction after February 18, 2005. Stationary combustion turbines at IGCC electric utility steam generating units are exempt from Subpart KKKK if they combust more than 75 percent syngas on an annual basis. Since the PMEC combustion turbines is designed to burn more than 75 percent syngas on an annual basis, Subpart KKKK does not apply.

5.1.2.1.1.2 Subpart Da, Standards of Performance for Electric Utility Steam Generating Units for Which Construction is Commenced After September 18, 1978

Subpart Da applies to new electric utility steam generating units with heat input from fuels combusted exceeding 250 MMBtu/hr. Heat recovery steam generators and associated stationary combustion turbines burning fuels containing 75 percent (by heat input) or more synthetic-coal gas on a 12-month rolling average are subject to Subpart Da and are not subject to Subpart KKKK. Turbines associated with PMEC would be considered "electric utility stationary gas turbines" because more than one-third of their potential electric output capacity would be supplied to a utility power distribution system.

Subpart Da emission standards that would apply to the PMEC combustion turbines are summarized in Table 5.1-1. Table 5.1-1 also identifies corresponding PMEC characteristics using the Subpart Da units of measure. Because the proposed emission rates for the proposed PMEC reflect BACT (which is at least as stringent as NSPS limits), the emission rates proposed for PMEC comply with those prescribed by Subpart Da. Note that the combustion turbines would comply with the SO₂ reduction requirement required by this Subpart Da since the facility would be designed to achieve a 97 percent sulfur reduction from the syngas cleaning steps downstream of the gasifier.

**TABLE 5.1-1
SUMMARY OF NEW SOURCE PERFORMANCE STANDARDS**

NSPS SUBPART DA (APPLIES TO CTS WHEN FIRING SYNGAS)

	Units	NO _x	SO ₂	PM ₁₀	Hg
NSPS Criteria	lb/MWh	NA	1.4	0.14	2.00E-05
	lb/MMBtu	0.50	NA	0.015	
	% reduction	25%	95%	NA	
PMEC emissions	lb/hr	32	74	24	6.85E-03
	lb/MWh	0.044	0.101	0.033	9.32E-06
	lb/MMBtu	0.015	0.035	0.011	3.26E-06
	% reduction	NA	>97%	NA	90%
Opacity limit of 20% also applies. Must comply with either PM and either SO ₂ limit. NO _x and SO ₂ limits are based on a 30-day rolling average. Hg limit is based on a 12-month rolling average. 1) MWh measured as gross energy output 2) MMBtu measured as heat input to CT 3) Gross power output per turbine (MW): 735 4) Heat input per turbine (MMBtu/hr, HHV): 2,100					

NSPS Subpart Db (applies to auxiliary boiler)

	Units	NO _x	SO ₂	PM ₁₀
NSPS Criteria	lb/MWh	0.43	NA	NA
	lb/MMBtu	NA	0.020	NA
PMEC emissions	lb/hr	4.7	0.37	NA
	lb/MMBtu	0.036	0.003	NA
NO _x limits are based on a 30-day rolling average. SO ₂ limit is based on a 30-day rolling average. Rated capacity of boiler (MMBtu/hr, HHV): 130				

NSPS Subpart Dc (applies to tank vent boiler)

	Units	NO _x	SO ₂	PM ₁₀
NSPS Criteria	lb/MWh	NA	NA	NA
	lb/MMBtu	NA	0.20	0.03
PMEC emissions	lb/hr	19.5	5.8	0.7
	lb/MMBtu	0.03	0.089	0.011
	% reduction	NA	>97%	NA
Opacity limit of 20% also applies. Must comply with either the 0.20 lb/MMBtu SO ₂ limit or comply with a 90 percent SO ₂ reduction and 1.2 lb/MMBtu SO ₂ limit. Expected heat input (MMBtu/hr): 65				

5.1.2.1.1.3 Subpart HHHH, Hg Budget Trading Program General Provisions

Subpart HHHH applies to stationary coal-fired boilers or combustion turbine generators. Included in the definition of “coal-fired” is coal-derived fuel (such as syngas). Because the combustion turbines at PMEC fit these criteria, Energy Northwest must comply with the mercury budget and trading provisions in Subpart HHHH. After adoption by Ecology and approved by USEPA, PMEC would have to comply with emission limits and requirements resulting from the state implementation plan that would replace federal requirements.

5.1.2.1.1.4 Subpart Db, Standards of Performance for Industrial-Commercial-Institutional Steam Generating Units

Subpart Db applies to steam generating units that commence construction, modification, or reconstruction after June 19, 1984, and have a heat input capacity from fuels combusted in the steam generating unit of greater than 100 MMBtu/hr. Subpart Db would apply to the auxiliary boiler because it is rated at 130 MMBtu/hr.

Because the auxiliary boiler is fired solely with natural gas, the only substantive emission limits apply to NO_x (0.10 lb NO_x per MMBtu heat input) and SO₂ (0.02 lb SO₂ per MMBtu heat input). These limits apply at all times including startup, shutdown, and malfunction, and are expressed as a 30-day rolling average. Table 5.1-1 indicates the emission rates proposed for PMEC comply with those prescribed by Subpart Db.

Subpart Db requires operators to install, calibrate, maintain, and operate a Continuous Emission Monitoring System (CEMS) unless they choose a parametric monitoring option. PMEC plans to install a CEMS.

5.1.2.1.1.5 Subpart Dc, Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units

Subpart Dc applies to steam generating units that commence construction, modification, or reconstruction after June 9, 1989, and have a heat input capacity from fuels combusted greater than 10 MMBtu/hr and less than 100 MMBtu/hr. Subpart Dc would apply to the tank vent boiler because it is rated at 65 MMBtu/hr.

Because the tank vent boiler is fired with syngas and natural gas, a PM₁₀ emission limit (0.03 lb PM₁₀ per MMBtu heat input) applies. SO₂ emissions are limited to 0.20 lb SO₂ per MMBtu heat input. Subpart Dc allows facilities to limit SO₂ emissions to 1.2 lb SO₂ per MMBtu heat input and comply with a 90 percent reduction of SO₂ from the potential emission rate instead of limiting SO₂ emissions to 0.20 lb SO₂ per MMBtu heat input. Subpart Dc also requires a limit of 20 percent opacity (6-minute average), except for one 6-minute period per hour of not more than 27 percent opacity. The SO₂ limits apply at all times, but the PM₁₀ limits do not apply during startup, shutdown, and malfunction.

Subpart Dc requires operators to install, calibrate, maintain, and operate a CEMS for SO₂ and either oxygen or carbon dioxide at both the inlet and outlet of the SO₂ control device. An

alternative to the CEMS for SO₂ is estimating the SO₂ emission rates by sampling the fuel using approved Method 6B. A Continuous Opacity Monitoring System (COMS) is also required unless the operator chooses to install a CEMS for PM₁₀. Table 5.1-1 indicates the emission rates proposed for PMEC comply with those prescribed by Subpart Dc.

5.1.2.1.1.6 Subpart Y, Standards of Performance for Coal Preparation

Subpart Y applies to coal processing and conveying equipment, storage systems, and transfer and loading systems with capacities exceeding 200 tons per day. The only substantive emission standard is an opacity limit of 20 percent.

5.1.2.1.1.7 Subpart A, General Provisions

Subpart A identifies a number of monitoring, record-keeping, and notification requirements that generally apply to all NSPS subparts. Subpart A specifies that performance (source) tests must be conducted within 60 days of achieving maximum production rate at which the source would be operated, but not later than 180 days after initial startup.

Consistent with NSPS requirements, PMEC would notify EFSEC and USEPA of the anticipated initial start-up date, the actual start-up date, any changes in the facility that affect emissions, compliance sources tests, and certification tests for continuous emission monitors. PMEC would also maintain records of start-ups and shutdowns, malfunctions of control equipment or periods of excess emissions if they occur, and periods when continuous emission monitoring equipment is inoperative.

5.1.2.1.2 Title 4 (Acid Rain) Provisions

Title 4 of the Clean Air Act (CAA) Amendments of 1990 provide a strategy for reducing national emissions of NO_x and SO₂ as part of a comprehensive plan for reducing acid deposition. 40 CFR Part 72 requires any fossil fuel-turbine larger than 25 MW to monitor flow rate, oxygen, and NO_x and SO₂. The PMEC would be subject to these regulations. Monitoring may take the form of CEMS or calculations based on fuel sulfur monitoring or similar techniques. The requirements for CEMS are similar to those required under the NSPS except that CEMs for sources subject to 40 CFR Part 72 must meet more stringent accuracy limits during annual relative accuracy test audits.

USEPA limits national SO₂ emissions attributable to power generation by capping the number of SO₂ ‘allowances’ distributed each year. An ‘allowance’ corresponds to one ton of allowable SO₂ emissions. USEPA grants some older facilities a number of allowances each year; however sources built after 1996 must purchase all of their requisite allowances. Each March 1st, all sources subject to the Acid Rain program must possess one allowance for each ton of SO₂ emitted from that facility during the previous calendar year. Each source must use its monitoring data to calculate its required number of allowances.

5.1.2.1.3 State and Local Emission Limits

Emission limits are established by the BACT review process. The BACT analysis identifies pollutant-specific alternatives for emission control, and the pro's and con's of each alternative. The determination of which control scenario best protects ambient air quality is made on a case-by-case basis and considers the technical, economic, energy and environmental costs

Chapter 173-460 WAC requires that BACT also be employed to control emissions of TAPs (i.e., T-BACT). Generally, the same technologies or operations that reduce criteria pollutants also reduce TAPs. For example, the use of gaseous fuels instead of solid fuels reduces emissions of most criteria and TAPs. The use of combustion controls to optimize combustion also reduces both criteria and TAPs. The BACT analysis included as Appendix B-1 of this Application identifies the use of good combustion practices and gas cleaning as the BACT for TAPs.

General standards for maximum emissions for air pollution sources in Washington are outlined in WAC 173-400-040. This section limits visible emissions to 20% opacity except for 3 minutes per hour; controls nuisance particulate fallout, fugitive dust, and odors; and limits SO₂ emissions to no more than 1000 ppm (hourly average, 7% O₂, dry basis). WAC 173-400-050 identifies emission standards for combustion and incinerator units, and limits particulate matter emissions to 0.1 grains per dry standard cubic foot at 7% O₂.

SWCAA regulations mirror Ecology's emission limits for new sources. The SWCAA regulation's opacity standard limits the plume to 20% opacity except for 3 minutes of any hour. Particulate matter emissions are limited to 0.1 grains per dry standard cubic foot. Sulfur emissions, calculated as SO₂, are limited to 1000 ppm.

The maximum PM₁₀ emission rate from each combustion turbine would be 24 lb/hr. Given a flow rate of approximately 1 million actual cubic feet per minute (acfm) from each turbine, this emission rate corresponds to grain loadings of less than 0.01 grains/actual cubic foot (gr/acf). Adjusting for standard temperature and dry exhaust, emissions from each unit would also be less than 0.01 gr/dscf. Thus, the anticipated grain loading is less than 10 percent of the 0.1 gr/dscf allowed by the state regulation. Plume opacity associated with grain loadings this low would be less than 5 percent, which is well below the allowed 20 percent. The anticipated SO₂ concentrations of 10 ppm or less would be well below the state limit of 1000 ppm.

5.1.2.1.4 Notice of Construction and Application for Approval

State law (WAC 173-400-110) requires a NOC for the construction of new air contaminant sources in Washington. SWCAA maintains a similar regulation for new or modified sources in its jurisdiction. The NOC application provides a description of the facility and an inventory of pollutant emissions and controls. The reviewing agency, EFSEC, considers whether BACT has been employed and evaluates ambient concentrations resulting from these emissions to ensure compliance with ambient air quality standards. Pollutant emissions not governed by the PSD permit process would be addressed in an NOC permit.

5.1.2.1.5 Prevention of Significant Deterioration (PSD)

For the P MEC, EFSEC administers the PSD permit process. These regulations were established by USEPA to ensure that new or expanded major stationary sources that emit criteria pollutants above a significance rate do not cause air quality in areas that currently meet the standards (i.e., attainment areas) to deteriorate significantly. These regulations require the application of BACT, and set PSD increments, which limit the increases in SO₂, NO₂ and PM concentrations that may be produced by a new source. Increments have been established for three land classifications. The most stringent increments apply to Class I areas, which include wilderness areas and national parks. The Class I area nearest to Kalama is the Mt Adams Wilderness Area, located about 95 kilometers east of Kalama. The vicinity of the site is designated Class II str where less stringent PSD increments apply. There are no Class III areas in Washington so those increments are not pertinent to this analysis. Class I and Class II PSD increments are discussed further in Section 5.1.3.5.

The P MEC would be subject to PSD regulations because it would emit more than 100 tons per year of a regulated pollutant (See Table 5.1-12). Once subject to the PSD process, emissions of other pollutants that exceed specific significant emission rates must be evaluated. Annual emissions of NO_x, PM₁₀, SO₂, CO, volatile organic compounds (VOCs), and sulfuric acid mist from the P MEC would exceed the significant emission rates that trigger consideration in the PSD permit.

5.1.2.2 Criteria Pollutant Emissions

Criteria pollutants, including NO_x, SO₂, CO, VOCs and PM₁₀, would be emitted by P MEC emission units (See Table 5.1-12). The primary source of these emissions would be the two combustion turbines, although there would also be contributions from other emission sources. The following sections discuss the development of emission estimates from each source. Detailed supporting emission calculations are presented in the spreadsheets of Appendix B-3.

5.1.2.2.1 Combustion Turbine Generators

The P MEC would gasify coal or petcoke to power two combined cycle combustion turbine electric power generating plants. The electric power generating plants would have two sources of power generation, a combustion turbine-generator (CTG) with heat recovery steam generator (HRSG) and a steam turbine-generator (STG). The total net output of the facility would be approximately 600 MW.

The proposed gas turbines would be designed to accept preheated syngas as the primary fuel, with natural gas as an alternative fuel. Preheated syngas from the gasification section and compressed air are supplied to the turbine combustors. Diluent nitrogen added to the syngas fuel reduces the flame temperature in the combustor and thereby reduces production of NO_x. The hot exhaust gases exiting the combustor flow to the expander turbine, which drives the generator to produce electricity and also turns the air compressor section of the combustion turbine. Hot exhaust gas from the expander is ducted through the HRSG to generate high-energy steam that is used to produce additional electricity in the STG. Following heat recovery, the cooled CTG

exhaust gas is discharged to the atmosphere through the HRSG stacks. Selective Catalytic Reduction (SCR) control equipment for removal of NO_x emissions is located within the HRSG.

Although a combustion turbine manufacturer has not been selected, emissions estimates are based on Siemens model SGT6-5000F combustion turbines because they tend to have higher emissions than alternative models. The combustion turbines would be optimized to operate primarily on syngas, although they would also be able to operate on natural gas. It is expected that the turbines would operate a maximum of 440 hours per year on natural gas, and each turbine would be started up a maximum of 25 times per year on natural gas, each startup lasting up to 4 hours. Each turbine may operate every hour of the year. The estimated annual turbine emissions and assumptions are presented in Table 5.1-2.

**TABLE 5.1-2
MAXIMUM ANNUAL EMISSIONS FROM EACH TURBINE**

Pollutant	ton/year	Basis
NO _x	147	100 hr/yr startup/shutdown w/o SCR, plus 440 hr/yr natural gas full load operation, balance on syngas at full load
CO	561	100 hr/yr startup/shutdown, balance of year on syngas at full load
PM ₁₀	105	8760 hr/yr on syngas at full load
VOC	52	100 hr/yr startup/shutdown, balance of year on syngas at full load
SO ₂	65	10 ppm annual average sulfur in fuel, 8760 hr/yr on syngas at full load
NH ₃	86	8760 hr/yr on syngas at full load

Notes:

- 1) Startup/shutdown contribution to annual emissions based on approximately 25 starts per year per CTG on natural gas and about 4 hours per event.
- 2) Assumptions in "Basis" column used to estimate the maximum annual emissions.

Maximum short-term (hourly) emission rates for the turbines were calculated for: 1) normal full load operations burning syngas, 2) a turbine startup event on natural gas fuel, and 3) normal full load operation firing natural gas. The short-term dispersion modeling analyses presented in Sections 5.1.3 and 5.1.4 focus on syngas operation because the combustion turbines would operate on natural gas only when syngas is not available and because emissions of pollutants with short-term ambient standards are higher with syngas than with natural gas. Short-term emissions are presented in Table 5.1-3.

**TABLE 5.1-3
SHORT-TERM EMISSIONS FROM EACH TURBINE**

Operating Mode	Short-term Emissions (lb/hr)				
	SO ₂ ¹	NO _x	CO	PM ₁₀	VOC
Normal Syngas Operations	15	32	98	24	9
Worst-case startup	74	121	2740	11	263
Normal Natural Gas Operations	6.4	43	78	20	9

Notes:

- 1) Sulfur content for normal short-term operations was 10 ppm sulfur (as H₂S) in the syngas. Sulfur content in the syngas for the worst-case startup was 50 ppm sulfur

5.1.2.2.2 Tank Vent Oxidizer (TVO)

A tank vent oxidation system is used to oxidize off-gas components in the tank vent streams to oxidized form (SO₂, NO_x, H₂O, and CO₂), before venting them to the atmosphere. Although it would typically combust syngas, the TVO would operate on natural gas when syngas is unavailable. It is expected that the TVO would operate continuously. The annual operating scenario assumes 720 hours per year of natural gas combustion and 263 hours per year in a TVO startup mode. Short-term TVO emissions were calculated for 1) a normal TVO full load operation scenario burning cleaned syngas and 2) a short-term high sulfur emissions event. The estimated normal and maximum short-term and annual emission rates, based on supplier estimates for similar equipment, are shown in Table 5.1-4.

**TABLE 5.1-4
SHORT-TERM AND ANNUAL EMISSIONS FROM THE TANK VENT OXIDIZER**

Operating Mode	Short-term Emissions (lb/hr)				
	SO ₂ ¹	NO _x	CO	PM ₁₀	VOC
Normal Short-term Operations	3.6	19.5	5.9	0.7	0.3
Worst-case Short-term Operations	5.8	19.5	5.9	0.7	0.3
Annual Emissions (ton/yr)					
Annual Operation Emissions	15.9	26.4	7.9	0.9	0.4

Notes:

- 1 Sulfur content for normal short-term operations and annual operations was 10 ppm sulfur in the syngas. Sulfur content for the worst-case short-term operations was 50 ppm sulfur in the syngas.
- 2 Normal and worst-case short-term operating emissions based on maximum operations at 65 MMBtu/hr. Annual operating emissions include 400 hours at maximum load of 65 MMBtu/hr, 263 hours starting up, 720 hours burning natural gas and 7,377 hours burning syngas.

5.1.2.2.3 Auxiliary Boiler

The 130 MMBtu/hr auxiliary boiler would normally operate only when no steam is available from the gasifier or HRSGs. The boiler is expected to operate no more than 25% of the time, on an annual basis (i.e., annual capacity factor). The auxiliary boiler would be equipped with low NO_x burners for emission control. Emission rates based on supplier guarantees for similar equipment are shown in Table 5.1-5.

TABLE 5.1-5
SHORT-TERM AND ANNUAL EMISSIONS FROM THE AUXILIARY BOILER

Pollutant	Short-term Emissions (lb/hr)	Annual Emissions (ton/yr)
SO ₂	0.37	0.41
NO _x	4.68	5.12
CO	9.62	10.53
PM ₁₀	0.65	0.71
VOC	0.52	0.57

Notes:

Annual emissions based on maximum annual capacity factor of 25%.

5.1.2.2.4 Flare

The gasification island elevated flare would be utilized to burn partially combusted natural gas and scrubbed/desulfurized off-specification syngas during gasifier startups or to dispose of on-specification syngas during short-term combustion turbine outages. Syngas sent to the flare during normal planned flaring events would be filtered, water-scrubbed and further treated in the Selexol® or equivalent and mercury removal systems to remove regulated contaminants prior to flaring. Flaring of untreated syngas or other streams within the plant would only occur as an emergency safety measure during unplanned plant upsets or equipment failures. The flame would be enclosed in a refractory-lined combustion chamber, effectively eliminating any visible flame.

Under normal operations, only the natural gas pilot is expected to be burning in the flare. Prior to a complete plant startup cleaned syngas from the gasifier would be routed to the flare until sufficient quantity and quality is available to run the turbines. This entire plant startup process would take approximately 44 hours and is not expected to occur more than 12 times per year. The flare would also dispose of emergency releases from the PMEC during unplanned upset events.

Emissions from each of the expected short-term flaring events are summarized in Table 5.1-6. It is anticipated that up to 1755 MMBtu/hour of syngas could be flared for a maximum of 200 hours per year. This fuel estimate, along with the plant startup events and continuous use of the pilot, were used to calculate the maximum annual emissions. Annual emissions are summarized in Table 5.1-6.

**TABLE 5.1-6
SHORT-TERM AND ANNUAL EMISSIONS FROM THE FLARE**

Operating Mode	Short-term Emissions (lb/hr)				
	SO ₂ ¹	NO _x	CO	PM ₁₀	VOC
Normal Operations – Pilot only	0.01	0.14	1.10	0.02	0.01
Worst-case (startup) Conditions	9.49	19.04	415.57	2.18	1.63
Worst-case Upset	1,048	261	5,727	30	22
	Annual Emissions (ton/yr)				
Maximum Annual Operational Emissions	1.4	15	312	1.7	1.3

Notes:

- 1) Sulfur content for normal short-term operations was 1 grain sulfur/100 dscf pipeline natural gas. Sulfur content for the worst-case short-term (startup) operations was 50 ppm sulfur in the syngas. Sulfur content for the worst-case upset was 400 ppm sulfur in the syngas. Average sulfur content for purposes of annual emissions estimates was 10 ppm sulfur in the syngas.

5.1.2.2.5 Cooling Towers

Three cooling towers would be installed and operated at the PMEC. These cooling towers release water droplets that contain dissolved solids that occur naturally in the water supply, but are concentrated in the cooling process.

The Power Block and Gasification/ASU cooling towers are configured with 2 x 6 cells and 1 x 7 cells, respectively. The quantity of water released as droplets to the air (the drift rate) is based on 0.001% of the tower recirculation rate, and reflects the use of high efficiency drift eliminators. The total dissolved solids (TDS) content of the drift is the maximum value estimated from water quality measurement data for the makeup water. Table 5.1-7 shows the estimated maximum annual and short-term particulate matter emissions from the cooling towers as a result of drift, assuming continuous operation at 100% load for both turbines.

**TABLE 5.1-7
SHORT-TERM AND ANNUAL PM₁₀ EMISSIONS FROM THE COOLING TOWERS**

Parameter	Power Block	Gasification/ASU
Heat rejected, million Btu/hr	1740	1050
Cooling water (CW) circulation rate, million lb/hr	116	68
Maximum total dissolved solids (TDS) in makeup water (ppmw)	200	200
Cycles of concentration	12	12
Drift, % of circulating CW	0.001	0.001
PM ₁₀ emission rate, lb/hr	2.8	1.6
PM ₁₀ emission rate, ton/yr	12.2	7.1

5.1.2.2.6 Emergency Diesel Engines

A 2 MW diesel generator would be used for emergency power generation, and would be tested (at most) 100 hours per year. There would be two fire pump engines - one electric (no

emissions) and one 300-hp diesel engine. The diesel engine would also be tested a maximum of 100 hours per year. Emissions for these engines were estimated from the USEPA Non-road engine Tier 1 emission factors.

**TABLE 5.1-8
SHORT-TERM AND ANNUAL EMISSIONS
FROM THE EMERGENCY DIESEL EQUIPMENT**

Operating Mode	Short-term Emissions (lb/hr)				
	SO ₂	NO _x	CO	PM ₁₀	VOC
Emergency Generator, 2 MW	1.0	37	5	1.0	1.7
Fire Water Pump Engine, 300 hp	0.1	4	0.9	0.1	0.1
	Annual Emissions (ton/yr)				
	SO ₂	NO _x	CO	PM ₁₀	VOC
Emergency Generator, 2 MW	0.05	1.8	0.2	0.05	0.09
Fire Water Pump Engine, 300 hp	0.01	0.2	0.05	0.01	0.01

5.1.2.2.7 Fugitive Dust

Fugitive particulate matter emissions, also known as fugitive dust, would be generated by solid fuel (petcoke or coal) handling. By conscious design, the potential for fugitive dust from the material handling would be substantially reduced.

Unit trains delivering feedstock materials would unload in a negatively pressurized building into an underground hopper.¹ A baghouse would clean particulate matter from the air in the unloading building. The petcoke/coal would be unloaded from ships or barges using a rail mounted, continuous bucket ship unloader, then moved onto a dockside conveyor that is partially open on the top. This dockside conveyor would also be equipped with an associated baghouse to control the fugitive dust emissions. The petcoke/coal would move from the train or ship unloading areas on a covered conveyor to a transfer point between two enclosed fuel storage domes. These domes would ensure maximum control of fugitive dust and an enhanced visual appearance. The transfer point between the domes would have a baghouse to control fugitive dust emissions. The petcoke/coal would then be loaded into the storage domes. Only after the dust has settled inside the domes during each batch transfer would the dome ventilation system be restarted. Thus, the only sources of fugitive dust emissions would be the unloading of ships and trains, the conveyors transfer point between the storage domes, and the ventilation of the storage domes, all of which would be controlled by high efficiency fabric filter baghouses.

Fugitive particulate matter emissions were estimated using appropriate USEPA AP-42 emission factors for Aggregate Handling (Section 13.2.4). Short-term emissions were calculated for all sources, although all sources would not occur simultaneously; accordingly, three separate operating scenarios were considered to encompass the range of possible emissions for different combinations of source activities. For annual emission calculations, full PMEC petcoke/coal

¹ Note that no fugitive dust is expected from the tops of the railcars because the unit trains would be unloading at low speed and because the trains would have traveled up to 60 miles per hour (mph) for hundreds of miles prior to arrival at the PMEC. Any dust associated with coal or petcoke when the railcars were loaded would have been blown off long before arriving at PMEC.

capacity was assumed to be delivered by either ship or train; thus maximum annual emissions are from the combination of unloading, transfer point and storage dome emissions. Estimated emissions of PM₁₀ for these sources is summarized in Table 5.1-9.

**TABLE 5.1-9
SHORT-TERM AND ANNUAL EMISSIONS OF FUGITIVE DUST**

Scenario		Maximum Hourly	Maximum Daily	Annual Emissions
		lb/hr	lb/hr	ton/yr
1 - Train Unloading	Train Unloading	0.085	0.018	0.032
	Transfer Point to Storage Domes	0.085	0.051	0.032
	Total	0.171	0.069	0.064
2 - Ship Unloading	Transfer Point to Storage Domes	0.085	0.051	0.032
	Ship Unloading	0.350	0.350	0.220
	Total	0.436	0.401	0.252
3 - Dome Ventilation	Storage Dome Ventilation	0.085	0.051	0.032
Maximum Short-term Emissions		0.436	0.401	
Maximum Annual Emissions - include the max unloading emissions plus the dome ventilation emissions				0.284

5.1.2.2.8 Fugitive Equipment Leaks

VOC emissions associated with normal leakage from valve seals, pump and compressor seals, pressure relief valves, flanges, and similar equipment were calculated using anticipated component counts and USEPA fugitive emissions factors. Fugitive VOC emissions associated with leaks from gaseous and liquid streams are presented in Table 5.1-10. Fugitive emission factors were obtained from *Protocol for Equipment Leak Estimates*, USEPA 453-R95-017, November 1995.

**TABLE 5.1-10
SHORT-TERM AND ANNUAL VOC EMISSIONS FROM
THE FUGITIVE EQUIPMENT LEAKS**

Pollutant	Short-term Emissions (lb/hr)	Annual Emissions (ton/yr)
VOC	0.59	2.6

5.1.2.2.9 Locomotive and Ship Emissions

Petcoke and/or coal may be delivered to the PMEC by rail, barge, or ship. Emissions from locomotives pulling the train cars are not included in the emission modeling because they are

mobile sources powered by off-road engines, and these sources of emissions are specifically exempted from PSD modeling.

PSD regulations, codified in 40 CFR 52.21, require consideration of secondary emissions in ambient air quality evaluations. Secondary emissions are defined as

(18) Secondary emissions means emissions which would occur as a result of the construction or operation of a major stationary source or major modification, but do not come from the major stationary source or major modification itself. Secondary emissions include emissions from any offsite support facility which would not be constructed or increase its emissions except as a result of the construction or operation of the major stationary source or major modification. Secondary emissions do not include any emissions which come directly from a mobile source, such as emissions from the tailpipe of a motor vehicle, from a train, or from a vessel.

This blanket exclusion of vessel emissions was overturned in a subsequent court challenge. The Court supported exclusion of emissions from vessels traveling to and from a terminal, but directed USEPA to conduct additional studies before allowing a complete exemption of vessel emissions. In a 1990 letter on the issue of vessel emissions, USEPA provided the following guidance:

The preamble to the 1980 PSD regulations explains that emissions from certain activities of a ship docked at a terminal (i.e., when the vessel is stationary) may be considered emissions of the terminal if the activities would “directly serve the purposes of the terminal and be under the control of its owner or operator to a substantial extent” (45FR 52696). Vessel emissions which are not to be taken into account in determining whether a marine terminal is subject to PSD review (i.e., they are not primary emissions) are those which result from activities which do not directly serve the purposes of the terminal and are not under the control of the terminal owner or operator. The Court ordered USEPA to perform the analyses necessary to distinguish which dockside emissions, if any, should be assigned to the terminal and which should be assigned to the vessel. However, USEPA has not yet completed the analyses necessary to define which dockside vessel emissions, and under what conditions, should be assigned to the terminal and whether these would be considered primary or secondary emissions.

Although PMEC has quantified and evaluated fugitive PM₁₀ emissions from the unloading process, PMEC contends that emissions from vessel engines need not be included in the PMEC emission inventory. Ships would operate from a dock that is owned, controlled, and maintained by the Port of Kalama. PMEC would not control marine access to the terminal, nor would it own or control the ships and tugs which access the dock. The Port's terminal is a separate stationary source from the PMEC. Thus, while emissions from ship engines at the Port's dock may be considered secondary to the Port's terminal, they should not be considered secondary emissions from the PMEC.

It is also worth noting that the ship engines are incidental to the unloading operation of PMEC. The ships engines idle solely to reduce wear and tear caused by shutdowns and startups. Electric powered machinery at the dock would unload the ships, and the ship engines serve no purpose related to PMEC operation. Since the emissions associated with ship engine during unloading operations do not “directly serve the purposes of the terminal” and are not “under the control of

its owner or operator to a substantial extent”, they are legitimately exempt from inclusion in the PMEC emissions inventory.

PMEC would share use of the Port of Kalama dock with Steelscape, a rolled steel coating facility located directly south of the PMEC site. Since Steelscape began full operation in 1999, an average of 26 ships have used the Port’s dock each year. Ships are typically at the dock for 2 to 3 days. Thus, on a practical basis, emissions from ships on a daily basis are already occurring and there is no substantive increase in short-term emissions from the Port’s dock. Although annual emissions would increase if PMEC brought feedstock to the site by ship or barge, the number of ships and/or barges is uncertain. PMEC anticipates no more than 34 ships per year if ships are used, but expects barges to be the preferred delivery option.

5.1.2.2.10 Emissions Summary

Table 5.1-11 summarizes the maximum estimated short-term criteria pollutant emissions from all PMEC sources during normal operations and during startup or upset conditions. Note that it is not appropriate to add the maximum short-term emissions from all sources because maximum emissions from one unit may not occur simultaneously with those from another unit. Table 5.1-12 summarizes the maximum annual operational emissions from the PMEC.

**TABLE 5.1-11
SHORT-TERM EMISSIONS SUMMARY**

Emission Source	Normal Operational Emissions (lb/hr)					Maximum Short-term Emissions (lb/hr)				
	SO ₂	NO _x	CO	PM ₁₀	VOC	SO ₂	NO _x	CO	PM ₁₀	VOC
Combustion Turbine Generator 1	14.7	32.0	98.0	24.0	9.0	73.7	121.0	2740	24.0	263.0
Combustion Turbine Generator 2	14.7	32.0	98.0	24.0	9.0	73.7	121.0	2740	24.0	263.0
Tank Vent Oxidizer	3.50	19.50	5.85	0.65	0.26	5.78	19.50	5.85	0.65	0.26
Auxiliary Boiler	0.37	4.68	9.62	0.65	0.52	0.37	4.68	9.62	0.65	0.52
Flare	0.01	0.14	1.10	0.02	0.01	1048	261.2	5727	29.86	22.39
Emergency Diesel Generator	0.96	36.82	4.75	0.98	1.72	0.96	36.82	4.75	0.98	1.72
Emergency Diesel Fire Pump	0.11	4.03	0.91	0.12	0.14	0.11	4.03	0.91	0.12	0.14
Power Block Cooling Towers				2.78					2.78	
Gasification/ASU Cooling Towers				1.62					1.62	
Fugitive PM ₁₀ - transfer point to storage dome				0.09					0.09	
Fugitive PM ₁₀ - ship unloading				0.35					0.35	
Fugitive Equipment Leaks					0.59					0.59
Total	34.4	129.2	218.2	55.3	21.3	NA	NA	NA	NA	NA

**TABLE 5.1-12
ANNUAL EMISSIONS SUMMARY**

Emission Source	Maximum Annual Operational Emissions (ton/yr)				
	SO ₂	NO _x	CO	PM ₁₀	VOC
Combustion Turbine Generator 1	64.5	147.0	561.3	105.1	52.1
Combustion Turbine Generator 2	64.5	147.0	561.3	105.1	52.1
Tank Vent Oxidizer	15.86	26.40	7.92	0.88	0.35
Auxiliary Boiler	0.41	5.12	10.53	0.71	0.57
Flare	1.43	14.64	312.45	1.67	1.25
Emergency Diesel Generator	0.05	1.84	0.24	0.05	0.09
Emergency Diesel Fire Pump	0.01	0.20	0.05	0.01	0.01
Power Block Cooling Towers				12.19	
Gasification/ASU Cooling Towers				7.11	
Fugitive PM ₁₀ - transfer point to storage dome				0.03	
Fugitive PM ₁₀ - ship unloading				0.22	
Fugitive PM ₁₀ - dome ventilation fans				0.03	
Fugitive Equipment Leaks					2.6
Total	146.9	342.3	1,453.9	233.15	109.11
PSD Significant Emission Rate	40	40	100	15	40

5.1.2.3 Toxic Air Pollutants (TAPs)

The PMEC has the potential to emit non-criteria air pollutants that are regulated federally by the CAA Section 112 and locally by Ecology and EFSEC under Chapter 173-460 WAC. Some of these pollutants are deemed “hazardous air pollutants” (HAPs) under the CAA Section 112; others are defined as “TAPs under Chapter 173-460 WAC. For the sake of this application, we would generally refer to these pollutants as TAPs.

Table 5.1-13 identifies TAPs and HAPs that may be emitted by PMEC sources and Washington’s Small Quantity Emission Rates (SQERs). If the total emissions of a given pollutant are greater than its SQER, dispersion modeling is required to determine compliance with ambient air quality criteria (Acceptable Source Impact Levels, or ASILs).

TAP emissions at the PMEC would be reduced by the inherently low polluting IGCC technology and many of the same process features that control criteria emissions. A large portion of the heavy metals and other undesirable constituents of the feed would be immobilized in the non-hazardous vitreous slag by-product and thereby prevented from causing adverse environmental effects. Gaseous and particle-bound HAPs that may be contained in the raw syngas exiting the gasifiers would be totally or partially removed by the syngas particulate matter removal system, water scrubber, and AGR systems described in Section 2.3. In addition, the mercury removal carbon absorption beds would ensure that mercury emissions from the PMEC would be 10 percent or less of the mercury present in the feedstock as received.

The following section discusses the estimation of TAP emission rates from each source. Detailed emission calculations are presented in Appendix B-3.

**TABLE 5.1-13
SUMMARY OF TAPS ANALYZED FOR THE PMEC**

CAS # or MPCA #	Compound	Federally Listed Compound	Washington State	Small Quantity Emission Rate Exemption Level			Washington State Class A Annual Modeling Required	Washington State Class B 24- Hour Modeling Required
		HAP	TAP	Class A lb/yr	Class B lb/yr	Class B lb/hr		
106-99-0	1,3-Butadiene	Yes	Yes	0.5	-	-	No	No
75-07-0	Acetaldehyde	Yes	Yes	50	-	-	Yes	No
107-02-8	Acrolein	Yes	Yes	-	175	0.02	No	No
7664-41-7	Ammonia	No	Yes	-	17500	2	No	Yes
7440-36-0	Antimony	Yes	Yes	-	175	0.02	No	No
7440-38-2	Arsenic	Yes	Yes	**	-	-	Yes	No
7440-39-3	Barium	No	Yes	-	175	0.02	No	No
71-43-2	Benzene	Yes	Yes	20	-	-	Yes	No
7440-41-7	Beryllium	Yes	Yes	**	-	-	Yes	No
106-97-8	Butane	No	Yes	-	43748	5	No	No
7440-43-9	Cadmium	Yes	Yes	**	-	-	Yes	No
75-15-0	Carbon disulfide	Yes	Yes	-	17500	2	No	No
463581	Carbonyl sulfide	Yes	Yes	-	-	-	No	No
7782-50-5	Chlorine (Cl)	Yes	Yes	-	175	0.02	No	No
18540-29-9	Chromium, (hexavalent)	Yes	Yes	**	-	-	Yes	No
7440-48-4	Cobalt	Yes	Yes	-	175	0.02	No	No
7440-50-8	Copper	No	Yes	-	175	0.02	No	No
57-12-5	Cyanide (Cyanide ion, Inorganic cyanides, Isocyanide)	Yes	Yes	-	1750	0.2	No	No
100-41-4	Ethyl benzene	Yes	Yes	-	22750	2.6	No	No
7782-41-4	Fluorine (F)	No	Yes	-	175	0.02	No	No
50-00-0	Formaldehyde	Yes	Yes	20	-	-	Yes	No
110-54-3	Hexane	Yes	Yes	-	22750	2.6	No	No
7647-01-0	Hydrochloric acid	Yes	Yes	-	175	0.02	No	Yes

TABLE 5.1-13 (CONTINUED)
SUMMARY OF TAPS ANALYZED FOR THE PMEC

CAS # or MPCA #	Compound	Federally Listed Compound	Washington State	Small Quantity Emission Rate Exemption Level			Washington State Class A Annual Modeling Required	Washington State Class B 24- Hour Modeling Required
		HAP	TAP	Class A lb/yr	Class B lb/yr	Class B lb/hr		
7664-39-3	Hydrogen fluoride (Hydrofluoric acid)	Yes	Yes	-	175	0.02	No	Yes
6/4/7783	Hydrogen sulfide	Yes	Yes	-	175	0.02	No	Yes
7439-92-1	Lead	Yes	Yes	50	-	-	Yes	No
7439-96-5	Manganese	Yes	Yes	-	175	0.02	No	No
7439-97-6	Mercury	Yes	Yes	-	175	0.02	No	No
74-83-9	Methyl bromide (Bromomethane)	Yes	Yes	-	175	0.02	No	Yes
74-87-3	Methyl chloride (chloromethane)	Yes	Yes	-	43748	5	No	No
75-09-2	Methylene chloride (Dichloromethane)	Yes	Yes	50	-	-	Yes	No
7439-98-7	Molybdenum	No	Yes	-	5250	0.6	No	No
91-20-3	Naphthalene	Yes	Yes	-	22750	2.6	No	No
7440-02-0	Nickel	Yes	Yes	0.5	-	-	Yes	No
109-66-0	Pentane	No	Yes	-	43748	5	No	No
108-95-2	Phenol	Yes	Yes	-	10500	1.2	No	No
115-07-1	Propylene	Yes	No	-	-	-	No	No
7784-49-2	Selenium	Yes	Yes	-	175	0.02	No	No
7440-22-4	Silver	No	Yes	-	175	0.02	No	No
7664-93-9 14808-79-8	Sulfuric acid and sulfates	No	Yes	-	175	0.02	No	Yes
108-88-3	Toluene	Yes	Yes	-	43748	5	No	No
7440-62-2	Vanadium	No	Yes	-	175	0.02	No	No
1330-20-7	Xylenes	Yes	Yes	-	43748	5	No	No
Polyaromatic Hydrocarbon (PAH)¹		Yes	Yes	**	-	-	Yes	No
PAH	Benzo(a)pyrene	No	Yes					
PAH	Benz(a)anthracene	No	Yes					
PAH	Benzo(b)fluoranthene	No	Yes					

TABLE 5.1-13 (CONTINUED)
SUMMARY OF TAPS ANALYZED FOR THE PMEC

CAS # or MPCA #	Compound	Federally Listed Compound	Washington State	Small Quantity Emission Rate Exemption Level			Washington State Class A Annual Modeling Required	Washington State Class B 24- Hour Modeling Required
		HAP	TAP	Class A lb/yr	Class B lb/yr	Class B lb/hr		
PAH	Chrysene	No	Yes					
PAH	Dibenzo(a,h)anthracene	No	Yes					
PAH	Indeno(1,2,3-cd)pyrene	No	Yes					
PAH	2-Methylnaphthalene	No	No					
PAH	3-Methylchloranthrene	No	No					
PAH	7,12-Dimethylbenz(a)anthracene	No	No					
PAH	Acenaphthene	No	No					
PAH	Acenaphthylene	No	No					
PAH	Anthracene	No	No					
PAH	Benzo(g,h,i)perylene	No	No					
PAH	Benzo(k)fluoranthene	No	No					
PAH	Fluoranthene	No	No					
PAH	Fluorene	No	No					
PAH	Phenanthrene	No	No					
PAH	Pyrene	No	No					

Notes:

- 1) For the CAA Section 112 requirements the combination of all Polycyclic Aromatic Hydrocarbons (PAH) would be considered Polycyclic Organic Matter (POM), each individual PAH compound is not a HAP. For the Washington State requirements, the combination of the first 6 PAHs in the table is compared with the ASIL.
 - * Lead Class A ASIL 24-hour averaging time.
 - ** The ASIL is less than the threshold for use with the Small Quantity Emission Rate Exemption Levels.
 - *** Listed as a Class B pollutant, but there is no Small Quantity Emission Rate Exemption Level.

5.1.2.3.1 Combustion Turbine Generators

Emissions of TAPs from the CTGs were estimated based on emission factors for the coal feedstock as provided by the National Energy Technology Laboratory (NETL), United State Department of Energy (USDOE), *Major Environmental Aspects of Gasification-based Power Generation Technologies, Final Report*, December 2002, and test data from the Wabash River IGCC power plant. The Wabash factors for HAP metals and hydrochloric acid were adjusted to reflect worst-case PMEC feedstock composition considering the highest emissions from either regional petcoke or Powder River Basin (PRB) coal, which has a higher mercury content than petcoke. Ammonia slip emissions for normal operations are based on a proposed permit limit of 5 ppmvd at 15% O₂. Table 5.1-14 presents the total TAP emissions from both turbines for normal full load operations.

**TABLE 5.1-14
TAP EMISSIONS FROM BOTH TURBINES**

CAS # or MPCA #	Compound	Emission Factor (lb/10 ¹² Btu coal)	Short-term Emission (lb/hr)	Annual Emission (ton/yr)
75-07-0	Acetaldehyde	1.8	0.010	0.044
7440-36-0	Antimony	1.1	0.0061	0.027
7440-38-2	Arsenic	2.4	0.0132	0.058
56-55-3	Benz[a]anthracene	0.0023	0.000013	5.6E-05
71-43-2	Benzene	2.4	0.013	0.058
7440-41-7	Beryllium	0.26	0.0014	0.006
7440-43-9	Cadmium	9.6	0.05	0.232
75-15-0	Carbon disulfide	46	0.25	1.112
0-00-5	Chromium, total	0.51	0.0028	0.012
18540-29-9	Chromium, (hexavalent)	0.153	0.00084	0.004
7440-48-4	Cobalt	0.26	0.0014	0.006
57-12-5	Cyanide (Cyanide ion, Inorganic cyanides, Isocyanide)	5.7	0.031	0.138
50-00-0	Formaldehyde	17	0.09	0.411
7647-01-0	Hydrochloric acid	13	0.072	0.314
7664-39-3	Hydrogen fluoride (Hydrofluoric acid)	50	0.28	1.209
7439-92-1	Lead	0.56	0.0031	0.014
7439-96-5	Manganese	1.04	0.0057	0.025
7439-97-6	Mercury	1.2	0.0066	0.029
74-83-9	Methyl bromide (Bromomethane)	47.7	0.26	1.153
75-09-2	Methylene chloride (Dichloromethane)	2.2	0.012	0.053
91-20-3	Naphthalene	2.5	0.014	0.060
7440-02-0	Nickel	0.39	0.0022	0.009
108-95-2	Phenol	36.8	0.20	0.890
7784-49-2	Selenium	0.56	0.0031	0.014
7664-93-9 14808-79-8	Sulfuric acid and sulfates	572	3.2	13.830
108-88-3	Toluene	0.033	0.00018	0.001
7664-41-7	Ammonia	7141	39.42	172.66

Notes:

- 1) Both short-term and annual emissions based on both turbines operating at 100% load for the entire year.

5.1.2.3.2 Tank Vent Oxidizer

Tank vent oxidizer TAPs emissions were estimated based on emission factors for syngas feed from the NETL report and test data from the Wabash River IGCC power plant. Table 5.1-15 presents estimated maximum short-term and annual TAP emissions from the tank vent oxidizer.

**TABLE 5.1-15
TAP EMISSIONS FROM TANK VENT OXIDIZER**

CAS # or MPCA #	Compound	Emission Factor (lb/10 ¹² Btu syngas)	Short-term Emission (lb/hr)	Annual Emission (ton/yr)
75-07-0	Acetaldehyde	1.8	1.2E-04	1.6E-04
7440-36-0	Antimony	3.0	2.0E-04	2.6E-04
7440-38-2	Arsenic	15.8	1.0E-03	1.4E-03
56-55-3	Benz[a]anthracene	0.0023	1.5E-07	2.0E-07
71-43-2	Benzene	302	2.0E-02	2.6E-02
7440-41-7	Beryllium	0.09	5.9E-06	7.9E-06
7440-43-9	Cadmium	0.60	3.9E-05	5.3E-05
75-15-0	Carbon disulfide	46	3.0E-03	4.0E-03
0-00-5	Chromium, total	11.2	7.3E-04	9.8E-04
18540-29-9	Chromium, (hexavalent)	3.4	2.2E-04	2.9E-04
7440-48-4	Cobalt	12.8	8.3E-04	1.1E-03
57-12-5	Cyanide (Cyanide ion, Inorganic cyanides, Isocyanide)	50	3.3E-03	4.4E-03
100-41-4	Ethyl benzene	338	2.2E-02	3.0E-02
50-00-0	Formaldehyde	17	1.1E-03	1.5E-03
7647-01-0	Hydrochloric acid	9.9	6.4E-04	8.7E-04
7664-39-3	Hydrogen fluoride (Hydrofluoric acid)	0.6	3.9E-05	5.3E-05
7439-92-1	Lead	0.43	2.8E-05	3.7E-05
7439-96-5	Manganese	25.3	1.6E-03	2.2E-03
7439-97-6	Mercury	7.0	4.6E-04	6.1E-04
74-83-9	Methyl bromide (Bromomethane)	123	8.0E-03	1.1E-02
74-87-3	Methyl chloride (Chloromethane)	63	4.1E-03	5.5E-03
75-09-2	Methylene chloride (Dichloromethane)	5.9	3.8E-04	5.2E-04
91-20-3	Naphthalene	8.6	5.6E-04	7.5E-04
7440-02-0	Nickel	44.7	2.9E-03	3.9E-03
108-95-2	Phenol	126	8.2E-03	1.1E-02
7784-49-2	Selenium	2.5	1.6E-04	2.2E-04
7664-93-9 14808-79-8	Sulfuric acid and sulfates	572	3.7E-02	5.0E-02
108-88-3	Toluene	119	7.7E-03	1.0E-02
1330-20-7	Xylenes	135	8.8E-03	1.2E-02

Notes:

- 1) Short-term emissions based on a maximum operation of 65 MMBtu/hr and annual based on operations of 20 MMBtu/hr for the entire year.

5.1.2.3.3 Flare

Emissions of TAPs from the flare were estimated based on emission factors for syngas fuel from the NETL report and test data from the Wabash River IGCC power plant. Maximum annual emissions were estimated based on the syngas consumption rate described in the criteria pollutant flare section above. A sulfur content of 50 ppmvd syngas was used as the basis for calculating emissions of sulfuric acid. Table 5.1-16 presents the estimated TAP emissions from the flare for normal annual operations.

**TABLE 5.1-16
TAP EMISSIONS FROM FLARE**

CAS # or MPCA #	Compound	Emission Factor (lb/10 ¹² Btu syngas)	Short-term Emission (lb/hr)	Annual Emission (ton/yr)
75-07-0	Acetaldehyde	1.8	9.0E-05	3.9E-04
7440-36-0	Antimony	3.0	1.5E-04	6.6E-04
7440-38-2	Arsenic	15.8	7.9E-04	3.5E-03
56-55-3	Benz[a]anthracene	0.0023	1.2E-07	5.0E-07
71-43-2	Benzene	302	1.5E-02	6.6E-02
7440-41-7	Beryllium	0.09	4.5E-06	2.0E-05
7440-43-9	Cadmium	0.60	3.0E-05	1.3E-04
75-15-0	Carbon disulfide	46	2.3E-03	1.0E-02
0-00-5	Chromium, total	11.2	5.6E-04	2.5E-03
18540-29-9	Chromium, (hexavalent)	3.4	1.7E-04	7.4E-04
7440-48-4	Cobalt	12.8	6.4E-04	2.8E-03
57-12-5	Cyanide (Cyanide ion, Inorganic cyanides, Isocyanide)	50	2.5E-03	1.1E-02
100-41-4	Ethyl benzene	338	1.7E-02	7.4E-02
50-00-0	Formaldehyde	17	8.5E-04	3.7E-03
7647-01-0	Hydrochloric acid	9.9	4.9E-04	2.2E-03
7664-39-3	Hydrogen fluoride (Hydrofluoric acid)	0.6	3.0E-05	1.3E-04
7439-92-1	Lead	0.43	2.1E-05	9.3E-05
7439-96-5	Manganese	25.3	1.3E-03	5.5E-03
7439-97-6	Mercury (3)	0.7	3.5E-05	1.5E-04
74-83-9	Methyl bromide (Bromomethane)	123	6.2E-03	2.7E-02
74-87-3	Methyl chloride (Chloromethane)	63	3.2E-03	1.4E-02
75-09-2	Methylene chloride (Dichloromethane)	5.9	3.0E-04	1.3E-03
91-20-3	Naphthalene	8.6	4.3E-04	1.9E-03
7440-02-0	Nickel	44.7	2.2E-03	9.8E-03
108-95-2	Phenol	126	6.3E-03	2.8E-02
7784-49-2	Selenium	2.5	1.3E-04	5.5E-04
7664-93-9 14808-79-8	Sulfuric acid and sulfates	3,761	1.9E-01	8.2E-01
108-88-3	Toluene	119	6.0E-03	2.6E-02
1330-20-7	Xylenes	135	6.8E-03	3.0E-02

Notes:

- 1) Short-term and long-term emissions based on normal annual flare operations of 50 MMBtu/hr for the entire year. The syngas consumption rate includes normal pilot operations, plant/gasifier startups, shutdown deslag flaring and routine flaring.

5.1.2.3.4 Auxiliary Boiler

Emissions of TAPs from the auxiliary boiler were estimated based on USEPA AP-42 emission factors for natural gas-fired boilers and the maximum rated capacity of the boiler (130

MMBtu/hr). Maximum annual emissions were based on an annual capacity factor for this boiler of 25%. Table 5.1-17 presents the estimated TAP emissions from the auxiliary boiler.

TABLE 5.1-17
TAP EMISSIONS FROM AUXILIARY BOILER

CAS #	Compound	Emission Factor (lb/10 ⁶ scf)	Short-term Emission (lb/hr)	Annual Emission (ton/yr)
7440-38-2	Arsenic	2.00E-04	2.48E-05	2.7E-05
7440-39-3	Barium	4.40E-03	5.45E-04	6.0E-04
71-43-2	Benzene	2.10E-03	2.60E-04	2.8E-04
7440-41-7	Beryllium	1.20E-05	1.49E-06	1.6E-06
106-97-8	Butane	2.10E+00	2.60E-01	2.8E-01
7440-43-9	Cadmium	1.10E-03	1.36E-04	1.5E-04
7440-47-3	Chromium	1.40E-03	1.73E-04	1.9E-04
7440-48-4	Cobalt	8.40E-05	1.04E-05	1.1E-05
7440-50-8	Copper	8.50E-04	1.05E-04	1.2E-04
50-00-0	Formaldehyde	7.50E-02	9.29E-03	1.0E-02
110-54-3	Hexane	1.80E+00	2.23E-01	2.4E-01
7439-96-5	Manganese	3.80E-04	4.70E-05	5.2E-05
7439-97-6	Mercury	2.60E-04	3.22E-05	3.5E-05
7439-98-7	Molybdenum	1.10E-03	1.36E-04	1.5E-04
91-20-3	Naphthalene	6.10E-04	7.55E-05	8.3E-05
7440-02-0	Nickel	2.10E-03	2.60E-04	2.8E-04
109-66-0	Pentane	2.60E+00	3.22E-01	3.5E-01
7782-49-2	Selenium	2.40E-05	2.97E-06	3.3E-06
108-88-3	Toluene	3.40E-03	4.21E-04	4.6E-04
7440-62-2	Vanadium	2.30E-03	2.85E-04	3.1E-04
PAH	Benzo(a)pyrene	1.20E-06	1.49E-07	1.6E-07
PAH	Benz(a)anthracene	1.80E-06	2.23E-07	2.4E-07
PAH	Benzo(b)fluoranthene	1.80E-06	2.23E-07	2.4E-07
PAH	Chrysene	1.80E-06	2.23E-07	2.4E-07
PAH	Dibenzo(a,h)anthracene	1.20E-06	1.49E-07	1.6E-07
PAH	Indeno(1,2,3-cd)pyrene	1.80E-06	2.23E-07	2.4E-07
PAH	2-Methylnaphthalene	2.40E-05	2.97E-06	3.3E-06
PAH	3-Methylchloranthrene	1.80E-06	2.23E-07	2.4E-07
PAH	7,12-Dimethylbenz(a)anthracene	1.60E-05	1.98E-06	2.2E-06
PAH	Acenaphthene	1.80E-06	2.23E-07	2.4E-07
PAH	Acenaphthylene	1.80E-06	2.23E-07	2.4E-07
PAH	Anthracene	2.40E-06	2.97E-07	3.3E-07
PAH	Benzo(g,h,i)perylene	1.20E-06	1.49E-07	1.6E-07
PAH	Benzo(k)fluoranthene	1.80E-06	2.23E-07	2.4E-07
PAH	Fluoranthene	3.00E-06	3.71E-07	4.1E-07
PAH	Fluorene	2.80E-06	3.47E-07	3.8E-07
PAH	Phenanthrene	1.70E-05	2.10E-06	2.3E-06
PAH	Pyrene	5.00E-06	6.19E-07	6.8E-07

Notes:

- 1) Short-term emissions based on normal full load operations. Annual emission based on a maximum annual capacity factor of 25%.

5.1.2.3.5 Emergency Diesel Engines

Emissions of TAPs from the emergency generator and the fire pump were estimated based on USEPA AP-42 emission factors for large and small internal combustion diesel engines, respectively. Maximum annual emissions were based on annual operations of 100 hours of this

equipment for testing purposes only. Table 5.1-18 presents the estimated TAP emissions from the emergency fire pump and Table 5.1-19 presents the estimated TAP emissions from the emergency generator.

**TABLE 5.1-18
TAP EMISSIONS FROM EMERGENCY FIRE WATER PUMP**

CAS #	Compound	Emission Factor (lb/10 ⁶ Btu)	Short-term Emission (lb/hr)	Annual Emission (ton/yr)
106-99-0	1,3-Butadiene	3.91E-05	8.21E-05	4.11E-06
75-07-0	Acetaldehyde	7.67E-04	1.61E-03	8.05E-05
107-02-8	Acrolein	9.25E-05	1.94E-04	9.71E-06
71-43-2	Benzene	9.33E-04	1.96E-03	9.80E-05
50-00-0	Formaldehyde	1.18E-03	2.48E-03	1.24E-04
91-20-3	Naphthalene	8.48E-05	1.78E-04	8.90E-06
115-07-1	Propylene	2.58E-04	5.42E-04	2.71E-05
108-88-3	Toluene	4.09E-04	8.59E-04	4.29E-05
1330-20-7	Xylenes	2.85E-04	5.99E-04	2.99E-05
PAH	Benzo(a)pyrene	1.88E-07	3.95E-07	1.97E-08
PAH	Benzo(a)anthracene	1.68E-06	3.53E-06	1.76E-07
PAH	Benzo(b)fluoranthene	9.91E-08	2.08E-07	1.04E-08
PAH	Chrysene	3.53E-07	7.41E-07	3.71E-08
PAH	Dibenz(a,h)anthracene	5.83E-07	1.22E-06	6.12E-08
PAH	Indeno(1,2,3-cd)pyrene	3.75E-07	7.88E-07	3.94E-08
PAH	Acenaphthene	1.42E-06	2.98E-06	1.49E-07
PAH	Acenaphthylene	5.06E-06	1.06E-05	5.31E-07
PAH	Anthracene	1.87E-06	3.93E-06	1.96E-07
PAH	Benzo(g,h,i)perylene	4.89E-07	1.03E-06	5.13E-08
PAH	Benzo(k)fluoranthene	1.55E-07	3.26E-07	1.63E-08
PAH	Fluoranthene	7.61E-06	1.60E-05	7.99E-07
PAH	Fluorene	2.92E-05	6.13E-05	3.07E-06
PAH	Phenanthrene	2.94E-05	6.17E-05	3.09E-06
PAH	Pyrene	4.78E-06	1.00E-05	5.02E-07

Notes:

- 1) Short-term emissions based on normal full load operations. Annual emission based on 100 hours of engine testing.

**TABLE 5.1-19
TAP EMISSIONS FROM EMERGENCY GENERATOR**

CAS #	Compound	Emission Factor (lb/10⁶ Btu)	Short-term Emission (lb/hr)	Annual Emission (ton/yr)
75-07-0	Acetaldehyde	2.52E-05	4.73E-04	2.37E-05
107-02-8	Acrolein	7.88E-06	1.48E-04	7.40E-06
71-43-2	Benzene	7.76E-04	1.46E-02	7.28E-04
50-00-0	Formaldehyde	7.89E-05	1.48E-03	7.41E-05
91-20-3	Naphthalene	1.30E-04	2.44E-03	1.22E-04
115-07-1	Propylene	2.79E-03	5.24E-02	2.62E-03
108-88-3	Toluene	2.81E-04	5.28E-03	2.64E-04
1330-20-7	Xylenes	1.93E-04	3.62E-03	1.81E-04
PAH	Benzo(a)pyrene	2.57E-07	4.82E-06	2.41E-07
PAH	Benz(a)anthracene	6.22E-07	1.17E-05	5.84E-07
PAH	Benzo(b)fluoranthene	1.11E-06	2.08E-05	1.04E-06
PAH	Chrysene	1.53E-06	2.87E-05	1.44E-06
PAH	Dibenz(a,h)anthracene	3.46E-07	6.50E-06	3.25E-07
PAH	Indeno(1,2,3-cd)pyrene	4.14E-07	7.77E-06	3.89E-07
PAH	Acenaphthene	4.68E-06	8.79E-05	4.39E-06
PAH	Acenaphthylene	9.23E-06	1.73E-04	8.66E-06
PAH	Anthracene	1.23E-06	2.31E-05	1.15E-06
PAH	Benzo(g,h,i)perylene	5.56E-07	1.04E-05	5.22E-07
PAH	Benzo(k)fluoranthene	2.18E-07	4.09E-06	2.05E-07
PAH	Fluoranthene	4.03E-06	7.57E-05	3.78E-06
PAH	Fluorene	1.28E-05	2.40E-04	1.20E-05
PAH	Phenanthrene	4.08E-05	7.66E-04	3.83E-05
PAH	Pyrene	3.71E-06	6.97E-05	3.48E-06

Notes:

- 1) Short-term emissions based on normal full load operations. Annual emission based on 100 hours of engine testing.

5.1.2.3.6 Cooling Towers

Cooling towers for both the power block and gasifier/ASU unit would emit small quantities of TAPs. These TAPs come primarily from the inorganic material found in the makeup water. The TAP emissions were estimated from the concentrations of TAPs found in the Kalama well water analysis, application of a drift rate of 0.001% of the tower circulating water and continuous operation at 100% load for both turbines. Table 5.1-20 presents the estimated total TAP emissions from each cooling tower.

**TABLE 5.1-20
TAP EMISSIONS FROM THE COOLING TOWERS**

CAS #	Compound	Emission Factor	Short-term Emission	Annual Emission
		ppmw	(lb/hr)	(ton/yr)
Power Block Cooling Tower				
7440-38-2	Arsenic	0.005	5.80E-06	2.54E-05
7782-50-5	Chlorine (Cl)	2.5	2.90E-03	1.27E-02
7782-41-4	Fluorine (F)	0.3	3.48E-04	1.52E-03
7439-92-1	Lead	0.001	1.16E-06	5.08E-06
7439-96-5	Manganese (Mn)	2	2.32E-03	1.02E-02
7439-97-6	Mercury	0.0005	5.80E-07	2.54E-06
7784-49-2	Selenium	0.01	1.16E-05	5.08E-05
7440-22-4	Silver	0.001	1.16E-06	5.08E-06
Gasification/ASU Cooling Tower				
7440-38-2	Arsenic	0.005	3.38E-06	1.48E-05
7782-50-5	Chlorine (Cl)	2.5	1.69E-03	7.41E-03
7782-41-4	Fluorine (F)	0.3	2.03E-04	8.89E-04
7439-92-1	Lead	0.001	6.77E-07	2.96E-06
7439-96-5	Manganese (Mn)	2	1.35E-03	5.93E-03
7439-97-6	Mercury	0.0005	3.38E-07	1.48E-06
7784-49-2	Selenium	0.01	6.77E-06	2.96E-05
7440-22-4	Silver	0.001	6.77E-07	2.96E-06

5.1.2.3.7 Fugitive Equipment Leaks

TAP emissions associated with normal equipment leakage at the PMEC have been estimated using U.S. USEPA fugitive emission factors for valve seals, pump and compressor seals, pressure relief valves, flanges, and similar equipment.² Emission estimates are based on conservative equipment counts based on piping and instrumentation diagrams (P&IDs) for a typical 600 MW E-Gas IGCC project. TAP emission factors for each process stream are from the Wabash River gasification facility test results and ConocoPhillips/Fluor material balance calculations. TAP emissions from equipment leakage are presented in Table 5.1-21.

Note that the emission rate of fugitive hydrogen sulfide (H₂S) from the PMEC acid removal equipment has been derived based on the air toxics modeling analysis presented in Section 5.1.3.5. Specifically, the H₂S emission rate has been selected at a value that just complies with the Washington ASIL for this pollutant, based on the modeling results. Although the precise method of achieving a compliant emission rate has not yet been determined, PMEC would implement a combination of component design enhancements and leak detection and repair procedures to ensure that the maximum predicted ambient H₂S impact would be below the 0.9 µg/m³ ASIL.

² Protocol for Equipment Leak Estimates, U.S EPA 453-R95-017, November 1995

TABLE 5.1-21
TAP EMISSIONS FROM FUGITIVE EQUIPMENT LEAKS

CAS #	Compound	Short-term Emission (lb/hr)	Annual Emission (ton/yr)
7664-41-7	Ammonia	2.88E-02	1.26E-01
71-43-2	Benzene	1.78E-04	7.79E-04
75-15-0	Carbon disulfide	9.50E-04	4.16E-03
463581	Carbonyl sulfide	1.70E-03	7.45E-03
57-12-5	Cyanide (Cyanide ion, Inorganic cyanides, Isocyanide)	2.78E-04	1.22E-03
100-41-4	Ethyl benzene	1.57E-07	6.87E-07
50-00-0	Formaldehyde	3.30E-08	1.45E-07
110-54-3	Hexane	4.33E-08	1.90E-07
7647-01-0	Hydrochloric acid	3.06E-03	1.34E-02
6/4/7783	Hydrogen sulfide	1.17E-01	5.11E-01
91-20-3	Naphthalene	7.30E-07	3.20E-06
108-95-2	Phenol	2.27E-09	9.94E-09
108-88-3	Toluene	1.88E-05	8.22E-05
1330-20-7	Xylenes	2.89E-07	1.27E-06

Notes:

- 1) See Appendix B-3 for detailed emissions calculations.

5.1.2.3.8 Emissions Summary

Table 5.1-22 presents a summary of estimated maximum annual TAP emissions for the PMEC. Detailed supporting emission calculations are provided in Appendix B-3.

**TABLE 5.1-22
MAXIMUM ANNUAL TAP EMISSIONS FROM THE PMEC**

CAS # or MPCA #	Compound	Annual Average Emission (ton/yr)									
		CTGs	TVO	Flare	Fugitive	Auxiliary Boiler	Power Cooling Tower	Gas/ASU Cooling Tower	Emergency Fire Pump	Emergency Generator	Total
106-99-0	1,3-Butadiene								4.11E-06		4.11E-06
75-07-0	Acetaldehyde	4.35E-02	1.58E-04	3.94E-04					8.05E-05	2.37E-05	4.42E-02
107-02-8	Acrolein								9.71E-06	7.40E-06	1.71E-05
7664-41-7	Ammonia	1.73E+02			1.26E-01						1.73E+02
7440-36-0	Antimony	2.66E-02	2.63E-04	6.57E-04							2.75E-02
7440-38-2	Arsenic	5.80E-02	1.38E-03	3.46E-03		2.71E-05	2.54E-05	1.48E-05			6.29E-02
7440-39-3	Barium					5.97E-04					5.97E-04
71-43-2	Benzene	5.80E-02	2.65E-02	6.61E-02	7.79E-04	2.85E-04			9.80E-05	7.28E-04	1.53E-01
7440-41-7	Beryllium	6.29E-03	7.88E-06	1.97E-05		1.63E-06					6.32E-03
106-97-8	Butane					2.85E-01					2.85E-01
7440-43-9	Cadmium	2.32E-01	5.26E-05	1.31E-04		1.49E-04					2.32E-01
75-15-0	Carbon disulfide	1.11E+00	4.03E-03	1.01E-02	4.16E-03						1.13E+00
463581	Carbonyl sulfide				7.45E-03						7.45E-03
7782-50-5	Chlorine (Cl)						1.27E-02	7.41E-03			2.01E-02
18540-29-9	Chromium, (hexavalent)	3.70E-03	2.94E-04	7.36E-04		1.90E-04					4.92E-03
7440-48-4	Cobalt	6.29E-03	1.12E-03	2.80E-03		1.14E-05					1.02E-02
7440-50-8	Copper					1.15E-04					1.15E-04
57-12-5	Cyanide (Cyanide ion, Inorganic cyanides, Isocyanide)	1.38E-01	4.38E-03	1.10E-02	1.22E-03						1.54E-01
100-41-4	Ethyl benzene		2.96E-02	7.40E-02	6.87E-07						1.04E-01
7782-41-4	Fluorine (F)						1.52E-03	8.89E-04			2.41E-03
50-00-0	Formaldehyde	4.11E-01	1.49E-03	3.72E-03	1.45E-07	1.02E-02			1.24E-04	7.41E-05	4.27E-01
110-54-3	Hexane				1.90E-07	2.44E-01					2.44E-01
7647-01-0	Hydrochloric acid	3.14E-01	8.65E-04	2.16E-03	1.34E-02						3.31E-01

TABLE 5.1-22 (CONTINUED)
MAXIMUM ANNUAL TAP EMISSIONS FROM THE PMEC

CAS # or MPCA #	Compound	Annual Average Emission (ton/yr)									
		CTGs	TVO	Flare	Fugitive	Auxiliary Boiler	Power Cooling Tower	Gas/ASU Cooling Tower	Emergency Fire Pump	Emergency Generator	Total
7664-39-3	Hydrogen fluoride (Hydrofluoric acid)	1.21E+00	5.26E-05	1.31E-04							1.21E+00
6/4/7783	Hydrogen sulfide				5.11E-01						5.11E-01
7439-92-1	Lead	1.35E-02	3.73E-05	9.32E-05			5.08E-06	2.96E-06			1.37E-02
7439-96-5	Manganese	2.51E-02	2.22E-03	5.54E-03		5.15E-05	1.02E-02	5.93E--03			4.90E-02
7439-97-6	Mercury	2.90E-02	6.13E-04	1.53E-04		3.52E-05	2.54E-06	1.48E-06			2.98E-02
74-83-9	Methyl bromide (Bromomethane)	1.15E+00	1.08E-02	2.69E-02							1.19E+00
74-87-3	Methyl chloride (chloromethane)		5.52E-03	1.38E-02							1.93E-02
75-09-2	Methylene chloride (Dichloromethane)	5.32E-02	5.17E-04	1.29E-03							5.50E-02
7439-98-7	Molybdenum					1.49E-04					1.49E-04
91-20-3	Naphthalene	6.04E-02	7.53E-04	1.88E-03	3.20E-06	8.27E-05			8.90E-06	1.22E-04	6.33E-02
7440-02-0	Nickel	9.43E-03	3.92E-03	9.79E-03		2.85E-04					2.34E-02
109-66-0	Pentane					3.52E-01					3.52E-01
108-95-2	Phenol	8.90E-01	1.10E-02	2.76E-02	9.94E-09						9.28E-01
115-07-1	Propylene								2.71E-05	2.62E-03	2.65E-03
7784-49-2	Selenium	1.35E-02	2.19E-04	5.48E-04		3.25E-06	5.08E-05	2.96E-05			1.44E-02
7440-22-4	Silver						5.08E-06	2.96E-06			8.04E-06
7664-93-9 14808-79-8	Sulfuric acid and sulfates	1.38E+01	5.01E-02	8.24E-01							1.47E+01
108-88-3	Toluene	7.98E-04	1.04E-02	2.61E-02	8.22E-05	4.61E-04			4.29E-05	2.64E-04	3.81E-02
7440-62-2	Vanadium					3.12E-04					3.12E-04
1330-20-7	Xylenes		1.18E-02	2.96E-02	1.27E-06				2.99E-05	1.81E-04	4.16E-02
Polyaromatic Hydrocarbon (PAH)¹											6.20E-05
PAH	Benzo(a)pyrene					1.63E-07			1.97E-08	2.41E-07	4.24E-07
PAH	Benz(a)anthracene	5.56E-05	2.01E-07	5.04E-07		2.44E-07			1.76E-07	5.84E-07	5.73E-05
PAH	Benzo(b)fluoranthene					2.44E-07			1.04E-08	1.04E-06	1.30E-06
PAH	Chrysene					2.44E-07			3.71E-08	1.44E-06	1.72E-06
PAH	Dibenzo(a,h)anthracene					1.63E-07			6.12E-08	3.25E-07	5.49E-07
PAH	Indeno(1,2,3-cd)pyrene					2.44E-07			3.94E-08	3.89E-07	6.72E-07

TABLE 5.1-22 (CONTINUED)
MAXIMUM ANNUAL TAP EMISSIONS FROM THE P MEC

CAS # or MPCA #	Compound	Annual Average Emission (ton/yr)									
		CTGs	TVO	Flare	Fugitive	Auxiliary Boiler	Power Cooling Tower	Gas/ASU Cooling Tower	Emergency Fire Pump	Emergency Generator	Total
PAH	2-Methylnaphthalene					3.25E-06					3.25E-06
PAH	3-Methylchloranthrene					2.44E-07					2.44E-07
PAH	7,12-Dimethylbenz(a)anthracene					2.17E-06					2.17E-06
PAH	Acenaphthene					2.44E-07			1.49E-07	4.39E-06	4.79E-06
PAH	Acenaphthylene					2.44E-07			5.31E-07	8.66E-06	9.44E-06
PAH	Anthracene					3.25E-07			1.96E-07	1.15E-06	1.68E-06
PAH	Benzo(g,h,i)perylene					1.63E-07			5.13E-08	5.22E-07	7.36E-07
PAH	Benzo(k)fluoranthene					2.44E-07			1.63E-08	2.05E-07	4.65E-07
PAH	Fluoranthene					4.07E-07			7.99E-07	3.78E-06	4.99E-06
PAH	Fluorene					3.80E-07			3.07E-06	1.20E-05	1.55E-05
PAH	Phenanthrene					2.30E-06			3.09E-06	3.83E-05	4.37E-05
PAH	Pyrene					6.78E-07			5.02E-07	3.48E-06	4.66E-06
	Total federal HAPs	5.87E+00	1.28E-01	3.19E-01	5.38E-01	2.56E-01	2.29E-02	1.34E-02	4.34E-04	4.10E-03	7.15
	Total Washington State TAPs	1.92E+02	1.78E-01	1.14E+00	6.64E-01	8.94E-01	2.45E-02	1.43E-02	3.98E-04	1.40E-03	195.28

Notes:

1) For the CAA112 requirements the combination of all Polycyclic Aromatic Hydrocarbons (PAH) would be considered Polycyclic Organic Matter (POM), each individual PAH is not a HAP. For the Washington State requirements, the combination of the first 6 PAHs in the table is compared with the ASIL.

5.1.3 LOCAL AIR QUALITY IMPACT ASSESSMENT

This section describes the local Air Quality Impact Assessment (AQIA) that has been conducted for the P MEC. Computer-based dispersion modeling techniques were applied to simulate dispersion of toxic and criteria pollutant releases from P MEC sources to estimate pollutant concentrations in the neighboring area. The results of the modeling analyses are used to assess compliance with Class II PSD increments, NAAQS, WAAQS, and Ecology's ASILs for TAPs. The dispersion modeling incorporates the emissions from the sources described in the previous section to predict ground level pollutant concentrations.

The dispersion modeling techniques employed in the analysis follow the USEPA regulatory guidelines (40 CFR Part 51, Appendix W). These guidelines include recommendations for model selection, data preparation, and model application, but allow flexibility on a case-by-case basis.

Section 5.1.3.1 summarizes stack parameters used for the simulation of airborne releases from the P MEC. Section 5.1.3.2 describes the data used to characterize existing ambient air quality and discusses the construction of a meteorological data set for dispersion modeling. Dispersion model selection and application are described in Section 5.1.3.3, followed by source impact assessment, PSD increment analysis, and ambient air quality standard assessments in Section 5.1.3.4, Section 5.1.3.5, and Section 5.1.3.6, respectively.

5.1.3.1 Stack Parameters, Building Dimensions, and Good Engineering Practice

In addition to emission rates, the modeling analysis requires estimates of the stack heights, building dimensions, and other parameters that characterize exhaust flows and/or atmospheric release characteristics from the P MEC emission sources. These release characteristics have an important influence on the results of the analysis. The stack parameters used in the dispersion modeling simulation of normal annual P MEC operations are presented in Table 5.1-23.

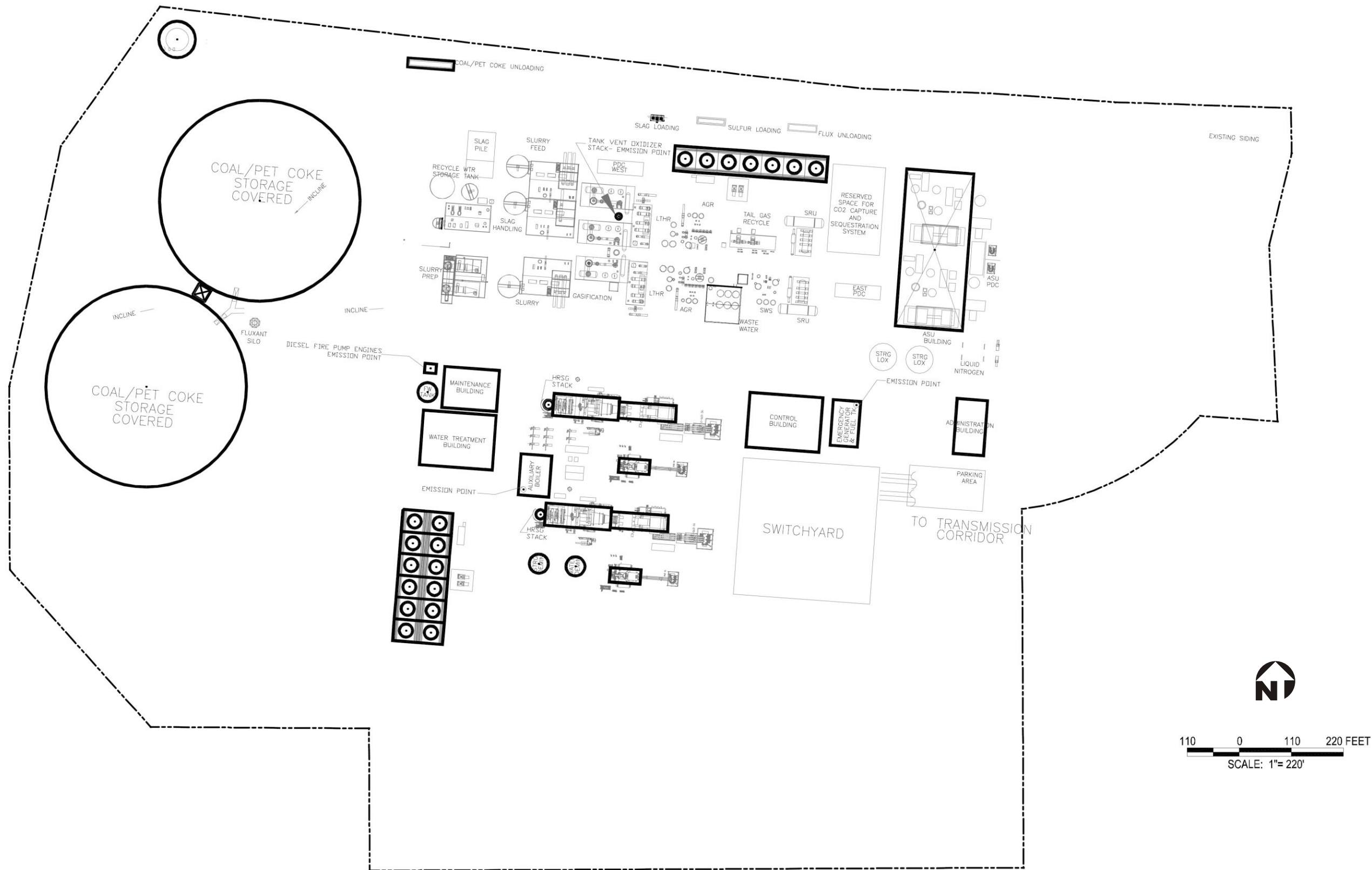
These parameters were obtained from the P MEC engineering consultant for the maximum load plant operating scenario described previously in Section 5.1.2. In reality, the P MEC would likely operate over a range of loads.

**TABLE 5.1-23
STACK PARAMETERS FOR NORMAL ANNUAL OPERATIONS**

Source	Stack Base Elevation above Sea level (m)	Stack height (m)	Temperature (K)	Exit velocity (m/s)	Stack diameter (m)
Combustion Turbine Generator/HRSG	3.66	45.72	394.26	20.568	6.096
Combustion Turbine Generator/HRSG	3.56	45.72	394.26	20.568	6.096
Tank Vent Oxidizer	3.66	64.008	579.82	8.462	1.8288
Auxiliary Boiler	3.66	12.192	422.04	9.702	1.5240
Enclosed Flare	4.57	30.480	1144.26	0.219	15.240
Emergency Generator	3.05	9.096	622	50.152	0.4064
Firewater Pump	3.96	3	622	57.445	0.127
Power Block Cooling Tower Cell	3.7	14.630	313.15	8.137	10.058
Power Block Cooling Tower Cell	3.7	14.630	313.15	8.137	10.058
Power Block Cooling Tower Cell	3.7	14.630	313.15	8.137	10.058
Power Block Cooling Tower Cell	3.7	14.630	313.15	8.137	10.058
Power Block Cooling Tower Cell	3.7	14.630	313.15	8.137	10.058
Power Block Cooling Tower Cell	3.7	14.630	313.15	8.137	10.058
Power Block Cooling Tower Cell	3.7	14.630	313.15	8.137	10.058
Power Block Cooling Tower Cell	3.7	14.630	313.15	8.137	10.058
Power Block Cooling Tower Cell	3.7	14.630	313.15	8.137	10.058
Power Block Cooling Tower Cell	3.7	14.630	313.15	8.137	10.058
Power Block Cooling Tower Cell	3.7	14.630	313.15	8.137	10.058
Gasification/ASU Cooling Tower	3.6	14.630	313.15	8.137	10.058
Gasification/ASU Cooling Tower	3.6	14.630	313.15	8.137	10.058
Gasification/ASU Cooling Tower	3.6	14.630	313.15	8.137	10.058
Gasification/ASU Cooling Tower	3.6	14.630	313.15	8.137	10.058
Gasification/ASU Cooling Tower	3.6	14.630	313.15	8.137	10.058
Gasification/ASU Cooling Tower	3.6	14.630	313.15	8.137	10.058
Gasification/ASU Cooling Tower	3.6	14.630	313.15	8.137	10.058
Storage dome ventilation baghouse	4.57	45.720	293.15	20.030	3.000
Train unloading baghouse	4.56	8.534	293.15	26.289	2.000
Ship unloading baghouse	3.66	8.230	293.15	15.023	1.000
Transfer point baghouse	4.57	45.720	293.15	15.023	1.000

5.1.3.2 Building Downwash

The effect of building wakes (i.e., downwash) on stack plumes was evaluated in accordance with USEPA guidance. Direction-specific building data were generated for stacks below good engineering practice (GEP) stack height, using the most recent version of USEPA Building Parameter Input Program – Prime (BPIP-Prime). The AERMOD model considers direction-specific downwash using both the Huber Snyder and Schulman-Scire algorithms, as represented in the BPIP-Prime program. Figure 5.1-1 shows the major structures that were used in the BPIP-Prime analysis.



5.1.3.3 Existing Ambient Air Quality and Meteorology

5.1.3.3.1 Meteorological Data

A meteorological database was constructed using available surface and upper air data for the dispersion modeling tools used in the air quality impact assessment. A survey of available meteorological data was conducted for use in the simulations. Two possible surface meteorological datasets from the National Weather Service (NWS) were identified that could be used in the dispersion modeling analysis: meteorological data collected at Longview Airport about nine kilometers north-northwest of the PMEC or the data collected at Portland International Airport about 55 kilometers (km) south-southeast of PMEC.

A meteorological station operated by TRC Consultants, Inc for Noveon Chemical (formerly Kalama Chemical and BF Goodrich), about three km south-southeast of PMEC, collects hourly wind speed, wind direction, solar radiation, differential temperature (ΔT), lateral wind turbulence ($\sigma\theta$), and temperature.³

After discussions with Ecology, a 1995 calendar year meteorological data set based on surface observations from Noveon Chemical was used in the dispersion modeling analysis. The station is located within the same portion of the Columbia River Valley as PMEC and collected data specifically for PSD permit applications. The sensors employed and the audit procedures used meet USEPA requirements for meteorological data to support PSD permits. The station collected the necessary data for the latest regulatory dispersion model AERMOD (described below), including $\sigma\theta$ for estimates of lateral dispersion. The Noveon dataset for 1995 has a 100 percent data recovery for all variables.

Figure 5.1-2 displays a wind rose constructed from the 1995 meteorological database. Winds at PMEC are bimodal, following the general north-south orientation of this portion of the Columbia River Valley. The average wind velocity for 1995 is 2.7 meter per second (m/s) and periods of calm wind are rare, occurring for less than one percent of the observations. Light winds tend to come up the valley from the north, while the highest wind velocities are from the south to southwest. The PMEC winds are quite different than observed at low levels at either Longview or Portland airports and reflect the influence of the local topography.

Additional meteorological variables and geophysical parameters are required by the dispersion modeling analysis to estimate the surface energy fluxes and construct boundary layer profiles. Surface characteristics including the surface roughness length, albedo, and Bowen ratio were assigned on a sector-by-sector basis using land use within three kilometers of PMEC. The USGS 1992 National Land Cover (NLCD92) land use data set used in the analysis has a 30 m mesh size and over 30 land use categories.⁴

³ TRC Environmental Consultants, 1996. *Meteorological Data Report, Kalama, Washington, Annual 1995*. TRC, 11 Inverness Drive East, Englewood, CO 80112, TRC Project 16826-01, April 25, 1996.

⁴ The USGS NLCD92 data set is described and can be accessed at <http://landcover.usgs.gov/natl/landcover.php>.

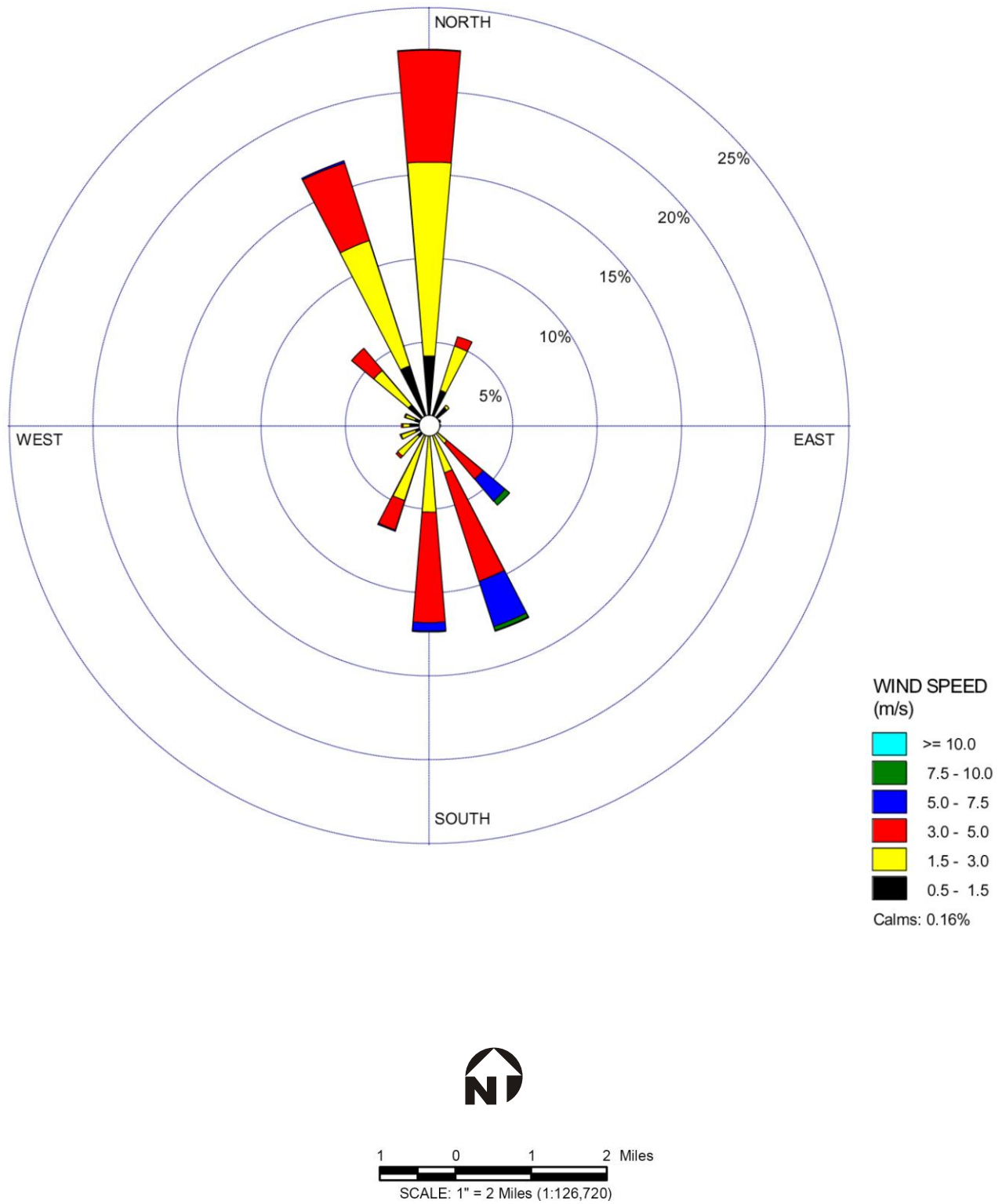


Figure 5.1-2
Port of Kalama Windrose for 1995

The NLCD92 data were processed using the utilities that accompany the CALPUFF modeling system. Land use was characterized in eight upwind sectors surrounding P MEC. Within each sector a weighted average surface roughness length, albedo, and Bowen ratio was calculated from the characteristics recommended for each land use by the CALPUFF utility program MAKEGEO. Arithmetic averages were used for the albedo and Bowen ratio, while a geometric or logarithmic average was used for surface roughness length.

The USEPA meteorological program AERMET was used to combine the Noveon and Portland observations with twice daily upper air soundings from Salem and derive the necessary variables for AERMOD. Portland NWS observations are used primarily for cloud cover and relative humidity to supplement the Noveon onsite data. The upper air data are used to estimate the temperature lapse rate aloft and subsequently by AERMET to predict the development of the mixed layer height. The Bulk-Richardson option was used to estimate dispersion variables and surface energy fluxes during nocturnal periods, while solar radiation and wind speed are used by AERMET to estimate these same variables during the day. The sigma-theta data from the Noveon site are passed through by AERMET to AERMOD for the lateral dispersion algorithms.

5.1.3.3.2 Background Air Quality

The USEPA maintains a database that contains air quality data from monitoring sites across the United States. The USEPA AirData website (<http://www.usepa.gov/air/data/info.html>) allows users to collect yearly summarized air quality data for specific monitoring sites. Air quality measurement data were collected for 2004 and 2005 for monitoring sites located in Washington and Oregon. The air quality data search was narrowed to five monitoring sites: two sites in Vancouver, one site in Longview; one site in Seattle, and one site located in Portland. In general, these stations are located where there may be air quality problems, and so are usually in or near urban areas or close to specific large air pollution sources.

Ecology and USEPA designate regions as being "attainment" or "nonattainment" areas for particular air pollutants based on monitoring information collected over a period of years. Attainment status is therefore a measure of whether air quality in an area complies with the health-based ambient air quality standards displayed in Table 3.2-1. Cowlitz County is in attainment for all air pollutants.

The 2004 and 2005 monitoring data from the five sites can be used to characterize existing air quality at the site. A summary of these data is presented in Table 5.1-24. All observed pollutant concentrations at these monitoring sites are lower than the NAAQS and both the WAAQS and Oregon state ambient air quality standards (OAAQS).

- NO₂ was monitored in Portland, where the maximum annual concentration was less than 22% of the NAAQS.
- CO was monitored in Vancouver, where the maximum concentrations were less than 55% of the NAAQS.

- The data in Table 5.1-24 indicate industrial sources do not contribute significant amounts of SO₂ in the area. SO₂ was monitored in Portland and Seattle. The maximum concentrations were less than 20% of the NAAQS.
- The maximum hourly ozone concentrations monitored in Portland were about 72% of the 1-hour NAAQS.
- PM₁₀ concentrations (usually associated with wood smoke, fugitive dust, and combustion sources) were monitored in Longview, where maximum concentrations were less than 51% of the NAAQS.
- Ignoring temporal and spatial averaging, PM_{2.5} was monitored in Vancouver, where maximum concentrations were about 69% of the annual and 67% of the 24-hour PM_{2.5} standards.

**TABLE 5.1-24
SUMMARY OF AIR QUALITY DATA (2004 AND 2005)**

Pollutant	Averaging Period (hours)	Data Source	Maximum Concentration		2004 - 2005 Average of Maximum concentrations	Lowest of the NAAQS/WAAQS / OAAQS
			2004	2005		
PM ₁₀ (µg/m ³)	24	a	39	77	58	150
	Annual	a	17	23	20	50
PM _{2.5} (µg/m ³)	24	b	45	34	39.5	65
	Annual	b	10.1	8.7	9.4	15
SO ₂ (ppm)	1	c	0.044	0.06	0.052	0.40
	3	c	0.028	0.045	0.037	0.50
	24	c	0.014	0.019	0.017	0.10
	Annual	c	0.004	0.003	0.0035	0.02
SO ₂ (ppm)	1	d	--	0.015	0.015	0.40
	3	d	--	0.012	0.012	0.50
	24	d	--	0.006	0.006	0.10
	Annual	d	--	0.002	0.002	0.02
Ozone (ppm)	1	d	0.087	0.072	0.080	0.12
	8	d	0.072	0.062	0.067	0.08 ^f
NO ₂ (ppm)	Annual	d	0.010	0.011	0.011	0.05
CO (ppm)	1	e	6.4	7.2	6.8	35
	8	e	5.0	4.9	5.0	9

Ref: USEPA's AIRS database (<http://www.epa.gov/air/data/info.html>) Accessed February 2006.

- (a) Longview, WA (254 Oregon Wy)
- (b) Vancouver, WA (8205 E 4th Plain Blvd)
- (c) Seattle, WA (Beacon Hill, WA)
- (d) Portland, OR (5824 SE Lafayette)
- (e) Vancouver, WA (2101 E 4th Plain Blvd)

5.1.3.4 Dispersion Model Selection and Application

The most recent version (04300) of the AERMOD model was used for the air quality modeling. AERMOD is the preferred USEPA guideline model for near-field simulation of stack releases. AERMOD was used for modeling concentrations of pollutants having short-term (e.g., one to 24 hour) ambient standards with the appropriate averaging time selected. Modeling for pollutants having annual standards (i.e., PM₁₀, SO₂ and NO₂), was conducted using AERMOD with the PERIOD option to predict impacts for comparison with the annual standards.

An analysis of the land use adjacent to the P MEC was conducted in accordance with Section 7.2.3 of the Guideline on Air Quality Models (USEPA, 2005 and Auer, 1978). The land use analysis within 3 kilometers of the site was determined to be predominantly rural, such that rural dispersion coefficients were selected for all P MEC simulations. All AERMOD regulatory default settings were selected.

The receptor grids used in the modeling analyses are as follows:

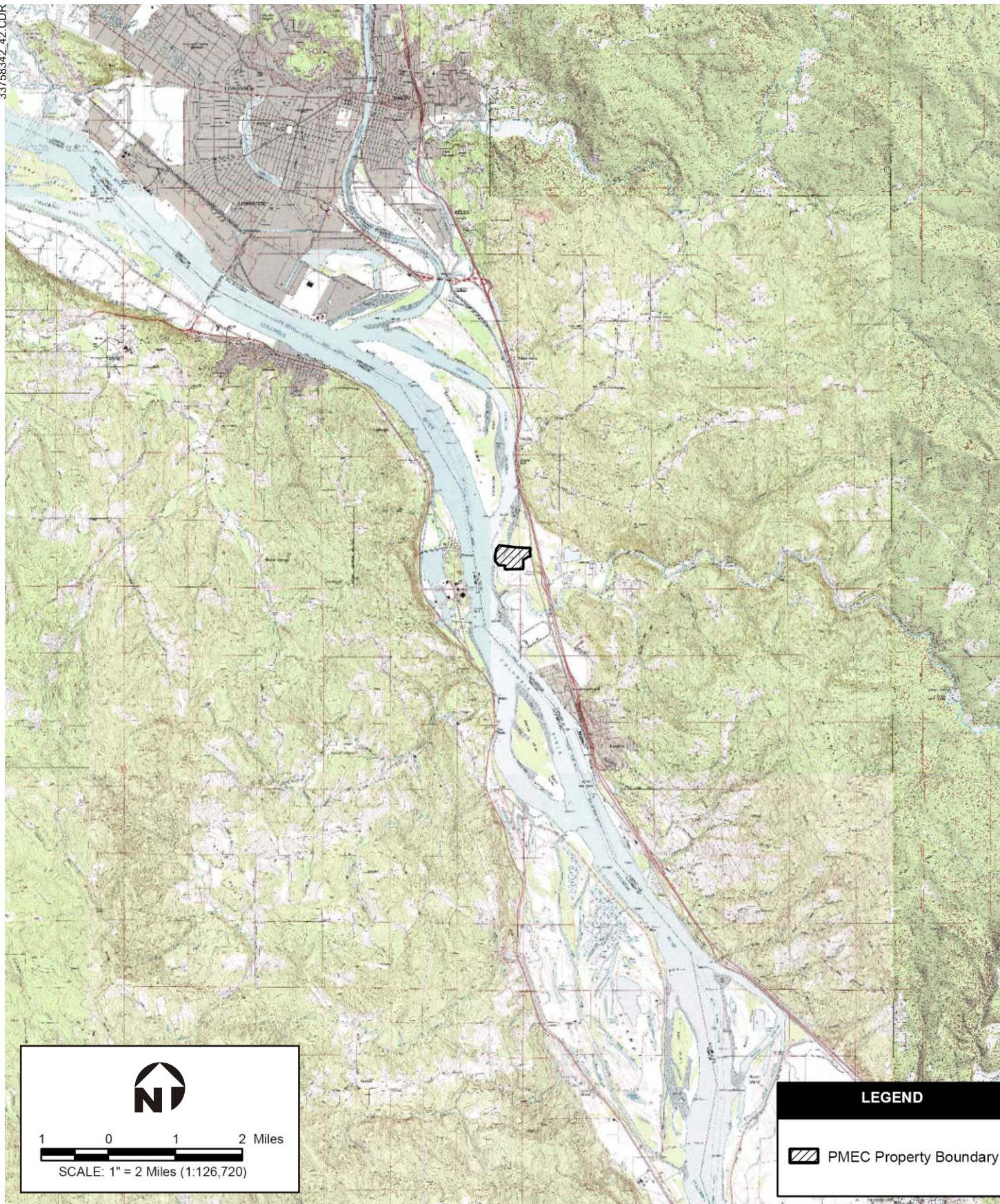
- 25-meter spacing along the property line and extending from the property line out to 100 meters beyond the property line;
- 100-meter spacing from 100 m to 1 km from the property line;
- 500-meter spacing from 1 km to 5 km from the property line; and
- 1,000-meter spacing from 5 km to 10 km from the property line.

When an initial maximum predicted concentration value was located in the portions of the receptor grid with 100-m, 500-m or 1,000-m spacing, a supplemental nested receptor grid was placed around the maximum concentration point and the model was rerun. The nested grid used consisted of 25-m spacing and extended 500 meters in all directions from the original point of maximum concentration. Actual Universal Transverse Mercator (UTM) NAD27 coordinates and digital terrain data provided by the USGS were used in all receptor grids. Local terrain out 10 kilometers from the P MEC is displayed in Figure 5.1-3.

A second receptor grid that excluded receptors within the Port property near the pier was modeled to address fugitive dust from unloading ships. The rationale for this exception is that during feedstock unloading events the Port area would be inhabited only by workers related to the P MEC operations. Thus, this area would not be considered to be within the “ambient air” during ship unloading for purposes of evaluating air quality impacts.

For the TAP modeling, receptors were placed at the same grid spacing, without the additional nested receptors.

Figures 5.1-4 through 5.1-6 show the receptor grids used in the modeling.



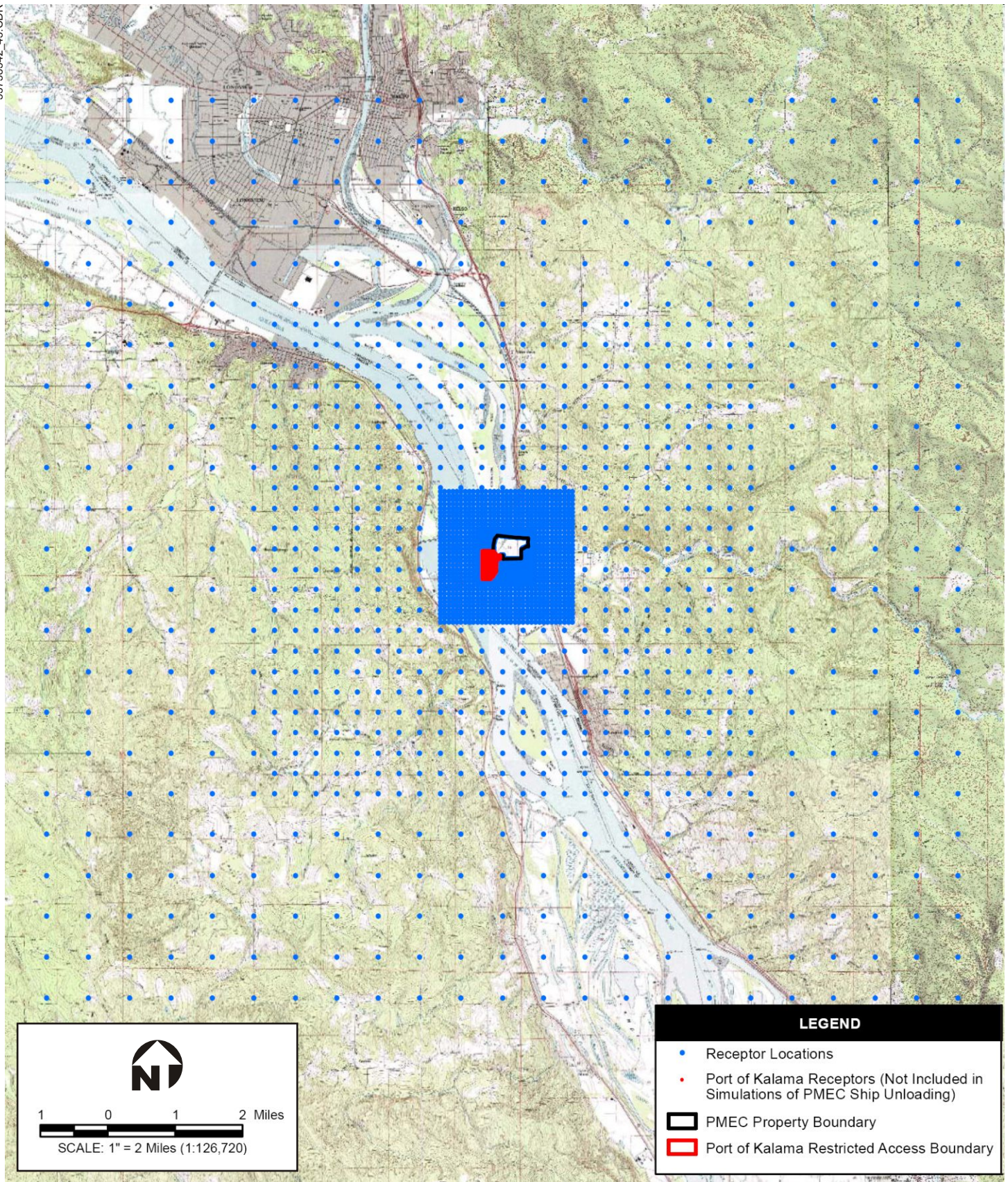
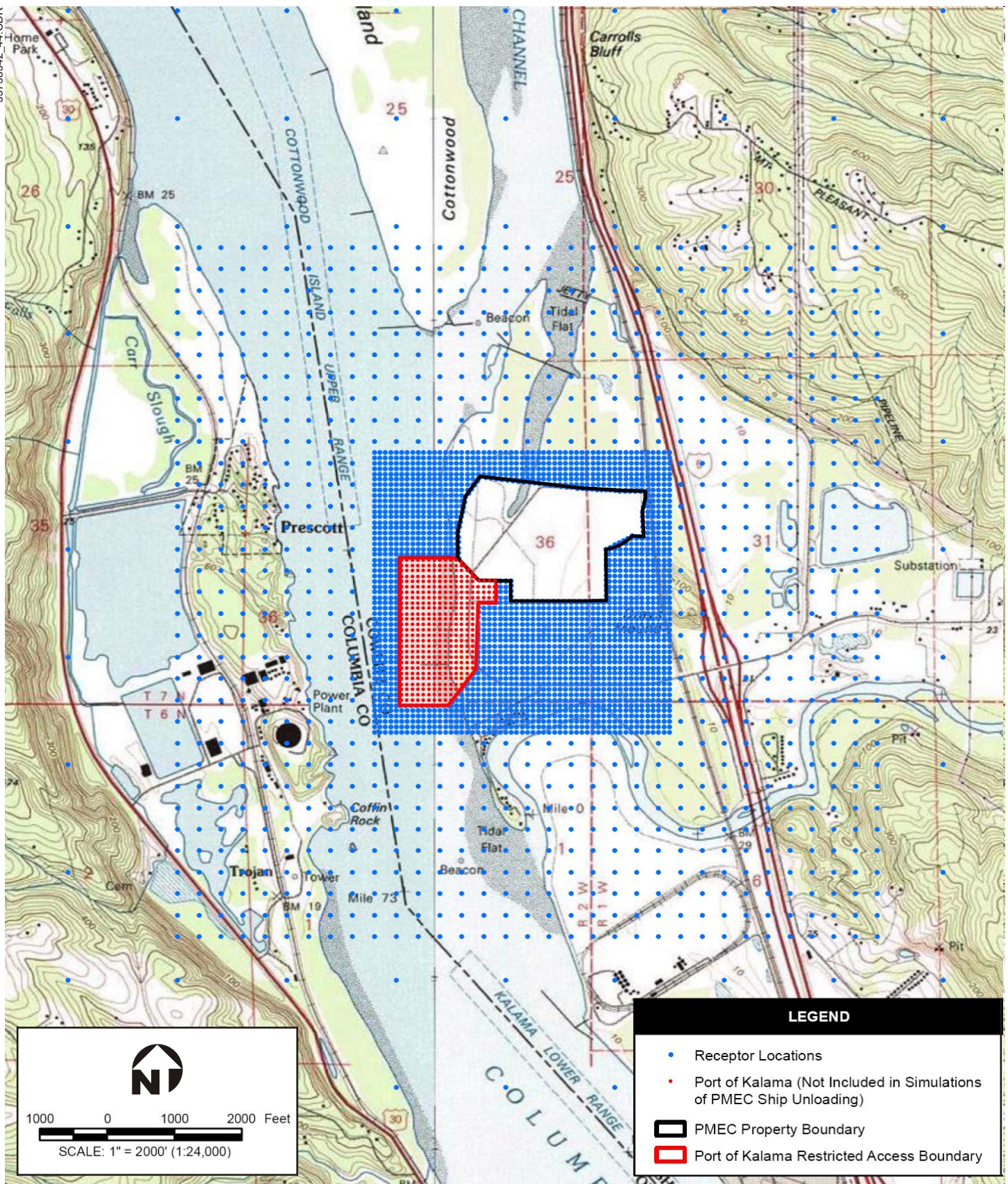


Figure 5.1-4
Far Field Modeling Receptor Grid



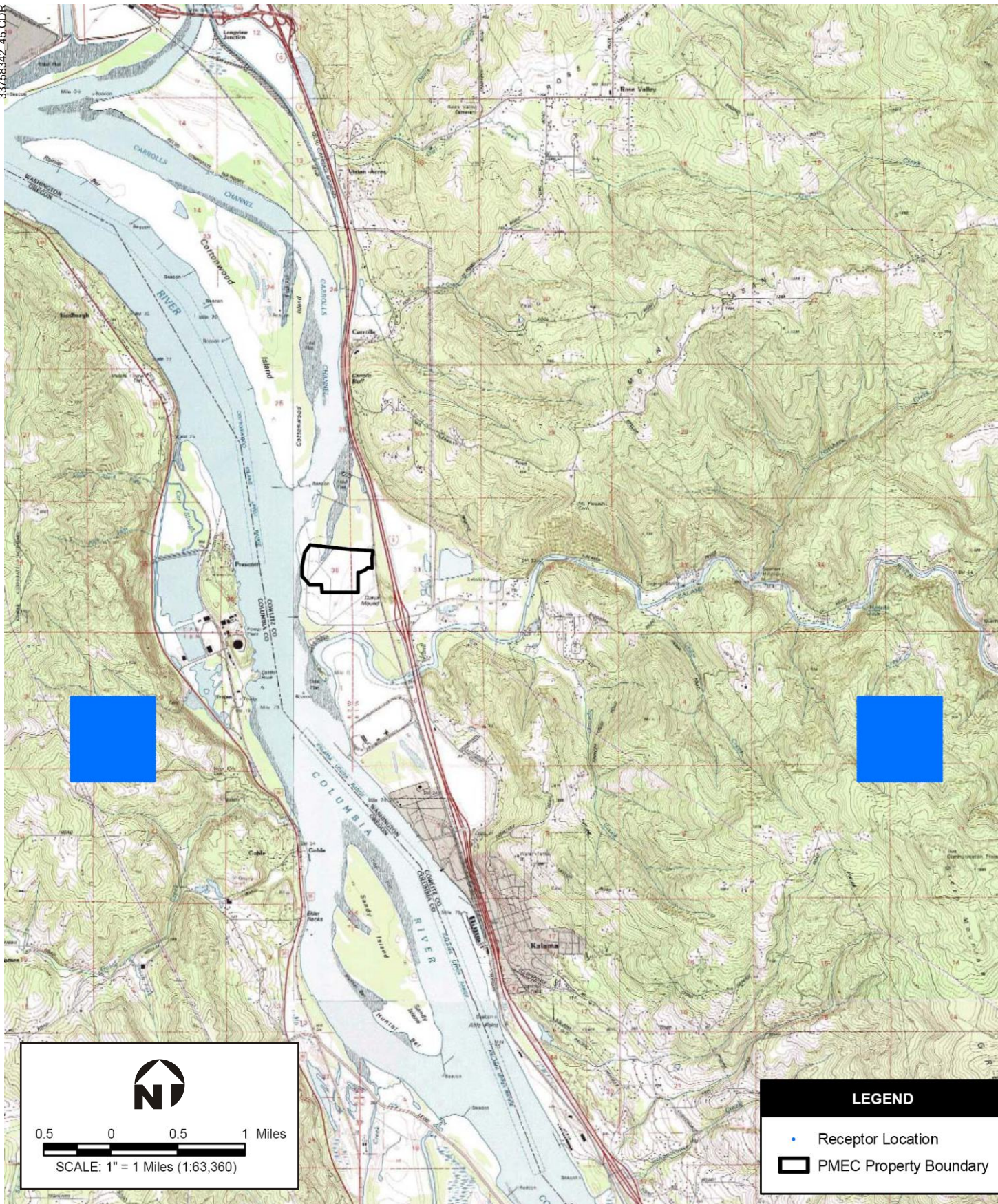


Figure 5.1-6

Additional Nested Grid Receptor Locations

Job No. 33758342

5.1.3.5 Impact Assessment

This section assesses the magnitude and spatial distribution of ground level concentrations predicted by dispersion modeling to result from PMEC emissions alone, i.e., in the absence of other background sources. In Section 5.1.3.6, predicted pollutant concentrations due to PMEC sources are combined with background ambient concentrations determined from representative monitoring data in order to provide a comparison of total predicted concentrations with ambient air quality standards.

5.1.3.5.1 Criteria Pollutants

The criteria pollutant concentrations predicted using AERMOD for normal PMEC operations are presented in Table 5.1-25. The annual NO₂ concentration was calculated from the predicted NO_x concentration using the Ambient Ratio Method (ARM). In order to assess the significance of the predicted values, the estimated maximum criteria pollutant concentrations attributable to the PMEC are compared with the USEPA SILs, Class II PSD Increments and PSD monitoring significance levels in Table 5.1-25. Concentrations below the SILs are considered to be insignificant, and these pollutants do not require further modeling assessments to address compliance with the Class II increments or cumulative modeling with other sources to demonstrate compliance with ambient air quality standards. The maximum concentrations for the proposed Innovative Control Technology (ICT) emissions scenario in Table 5.1-25 are all below the applicable SILs and PSD increments.

The results in Table 5.1-25 assume use of the Selexol gas cleaning system to reduce the sulfur content of the syngas to a low level and Selective SCR to limit combustion turbine/HRSG emissions to 3 ppmv at 15% O₂ firing syngas and 5 ppmv at 15% O₂ firing natural gas. As described in Section 2.11, PMEC has committed to implementation of this combination of controls as an ICT package. The control technology analyses summarized in Section 2.11 and detailed in Appendix B-1 determined that diluent injection is the appropriate NO_x BACT control technology for the PMEC turbines, as no IGCC power plant in the United States has thus far demonstrated successful operation with SCR. With diluent injection rather than Selexol and SCR, turbine/HRSG NO_x emissions would be 15 ppmv at 15% O₂ firing syngas and 25 ppmv at 15% O₂ firing natural gas. A separate modeling analysis was conducted to demonstrate that the PMEC would continue to comply with applicable air quality standards in the event the use of SCR is unsuccessful for this IGCC application. Combustion turbine emissions corresponding to 15 and 25 ppmv for syngas and natural gas, respectively, were substituted for the turbine emissions in this scenario. The results, presented in Table 5.1-25, show the predicted annual NO₂ concentrations for this BACT emissions scenario.

When the BACT level emissions are assumed, as indicated in Table 5.1-25, the annual NO₂ SIL is exceeded by a margin of 0.4 µg/m³. However, this result would correspond to a complete failure of the Selexol/SCR control whereas PMEC is committed to providing a fully operational Selexol/SCR control package. The results in Table 5.1-25 are compared only with the ambient standards and the PSD increments, as required for sources implementing ICT.

TABLE 5.1-25
MAXIMUM PREDICTED GROUND LEVEL CONCENTRATIONS FROM NORMAL
OPERATIONS OF THE PROJECT– WITH SELEXOL AND SCR CONTROLS (ICT)

Pollutant	Averaging Period	Maximum Modeled Concentration			PSD SIL (µg/m ³)	PSD Class II Increment (µg/m ³)	PSD Monitoring Significance (µg/m ³)
		(µg/m ³)	UTM X (m)	UTM Y (m)			
PM ₁₀	Annual	0.4	510,255	5,099,291	1	17	-
	24-hour	4.97	507,525	5,096,900	5	30	10
SO ₂	Annual	0.2	510,275	5,098,600	1	20	-
	24-hour	3	507,500	5,096,875	5	91	13
	3-hour	19.5	507,500	5,096,850	25	512	-
	1-hour	37.6	507,600	5,097,000	-	-	-
NO ₂	Annual	0.84	510,194	5,098,758	1	25	14
CO	8-hour	60	507,500	5,096,875	500	-	575
	1-hour	254	507,600	5,097,000	2,000	-	-

Notes:

- 1) The NO₂ annual concentration calculated using the USEPA Ambient Ratio Method (ARM).

TABLE 5.1-26
MAXIMUM PREDICTED GROUND LEVEL NO₂ CONCENTRATIONS FROM NORMAL
OPERATIONS OF THE PROJECT – WITH DILUENT INJECTION NO_x CONTROL
(BACT)

Pollutant	Averaging Period	Maximum Modeled Concentration			PSD SIL (µg/m ³)	PSD Class II Increment (µg/m ³)	PSD Monitoring Significance (µg/m ³)
		(µg/m ³)	UTM X (m)	UTM Y (m)			
NO ₂	Annual	1.4	510,250	5,098,600	N/A	25	14

Note:

- 1) The NO₂ annual concentration calculated using the USEPA Ambient Ratio Method (ARM).

Although not required by PSD regulations, a discussion presented later in this section shows that the addition of existing (background) pollutant concentrations to the maximum predicted concentrations attributable to the PMEC with either the ICT or BACT NO_x emission control scenario results in compliance with the NAAQS and WAAQS.

5.1.3.5.2 Toxic Air Pollutants

Chapter 173-460 WAC regulates TAPs from new and modified air pollution sources. This regulation establishes ASILs for more than 500 substances. Ecology conservatively set the ASILs to protect human health. For each "known, probable and potential" human carcinogenic pollutant (i.e., the Class A TAPs), the ASIL limits the risk of an additional cancer case to one in a million. The ASILs for most of the other (i.e., Class B) TAPs have been set by dividing threshold worker exposure limits by 300; this was done to protect public health in a community

with multiple sources of a TAP. Most Class A TAP ASILs are expressed as annual average concentrations. A few Class A pollutants and all Class B pollutants are expressed as 24-hour average concentrations.

When anticipated emissions of a given TAP exceed the SQER for that TAP, Chapter 173-460 WAC requires permit applications to include dispersion modeling of TAP emissions and to include a comparison of calculated concentrations with the ASILs. If calculated concentrations are less than the ASILs, a permit can be granted without further analysis. Otherwise, the applicant must revise the project or submit a health risk assessment demonstrating that toxic emissions from the project are sufficiently low to protect human health. For carcinogenic pollutants, the risk of an additional cancer case can not exceed one in 100,000. Concentrations below the ASILs indicate insignificant potential for adverse health effects from these chemicals. Table 5.1-13 identified TAPs emitted by the PMEC and was used to determine whether facility-wide emissions of each TAP exceed its SQER. The dispersion modeling analysis for those TAPs emitted at rates exceeding the SQERs was conducted in the same manner as for the criteria pollutants. Depending on the chemical, either the maximum predicted 24-hour or annual concentrations were compared with the ASILs.

Modeling results showing the maximum 24-hour and annual TAP concentrations attributable to the PMEC are compared with Ecology ASILs in Table 5.1-27 and Table 5.1-28, respectively. The maximum 24-hour and annual concentration predictions are less than the Ecology ASILs for all TAPs

**TABLE 5.1-27
MAXIMUM PREDICTED SHORT-TERM TAP CONCENTRATIONS**

CAS #	Compound	Maximum Predicted Concentration (ug/m3)	Washington State Class B ASIL (ug/m3)
7664-41-7	Ammonia	3.798	100
7647-01-0	Hydrochloric acid	0.035	7
7664-39-3	Hydrogen fluoride (Hydrofluoric acid)	0.027	8.7
6/4/7783	Hydrogen sulfide	0.886	0.9
74-83-9	Methyl bromide (Bromomethane)	0.025	5
7664-93-9 14808-79-8	Sulfuric acid and sulfates	0.524	3.3
7439-92-1	Lead	0.0003	0.5*

Note:

- 1) Lead is a Class A Compound although must be modeled with a 24-hour averaging time.

**TABLE 5.1-28
MAXIMUM PREDICTED ANNUAL TAP CONCENTRATIONS**

CAS #	Compound	Maximum Predicted Concentration (ug/m3)	Washington State Class A ASIL (ug/m3)
75-07-0	Acetaldehyde	0.00006	0.45
7440-38-2	Arsenic	0.00013	0.00023
71-43-2	Benzene	0.07527	0.12
7440-41-7	Beryllium	0.00001	0.00042
7440-43-9	Cadmium	0.00020	0.00056
18540-29-9	Chromium, (hexavalent)	0.00004	0.000083
50-00-0	Formaldehyde	0.00469	0.077
75-09-2	Methylene chloride (Dichloromethane)	0.00006	0.56
7440-02-0	Nickel	0.00037	0.0021
	Polyaromatic Hydrocarbon (PAH)	0.00000	0.00048

5.1.3.6 PSD Increment Analysis

Typically, this section of a PSD permit application would examine whether the PMEC complies with the Class II and Class I PSD increments. Since none of the maximum predicted criteria pollutant concentrations due to normal operational emissions of the PMEC exceed the SILs, no additional assessment of Class II increments is required.

5.1.3.7 Ambient Air Quality Standard Assessment

The preceding sections noted that predicted concentrations attributable to the PMEC are less than USEPA SILs for all criteria pollutants. Based on procedures that apply to PSD permits, this finding indicates that the PMEC would not have the potential to consume a significant fraction of the PSD increments, nor would it significantly affect ambient air concentrations. Consequently, discussions of increment consumption and a comparison of a project's impacts in combination with other sources are typically excluded when maximum predicted impacts are less than the SILs. Energy Northwest has chosen to include this cumulative impact assessment (NAAQS analysis), even though the PSD process does not require it.

This section sums calculated concentrations attributable to the PMEC with background pollutant concentrations with compares the total with ambient air quality standards. Some of the criteria pollutants are subject to both "primary" and "secondary" federal standards. Primary standards are designed to protect human health with a margin of safety for susceptible members of the public. Secondary standards are established to protect the public welfare from any known or anticipated adverse effects associated with these pollutants, such as soiling, corrosion, or damage to vegetation.

Compliance with the ambient air quality standards was assessed by calculating conservative cumulative concentrations using the sum of the highest modeled concentrations from the facility and estimates for the contributions from background sources. The influence of background sources is based on the air quality monitoring data from selected monitoring sites in Washington

and Oregon, as summarized in Section 5.1.3.3. The average of the highest air quality observations for 2004-2005 was used as the background concentration for each pollutant and averaging time addressed in the NAAQS and WAAQS. The monitoring sites were selected based on proximity to the PMEC. Because all sites are in urban locations, background concentrations near the PMEC site may be overestimated.

Total predicted concentrations for PMEC operations are compared to the WAAQS and NAAQS in Table 5.1-29. Note that Oregon ambient air quality standards are virtually the same as Washington standards, with the only exceptions being those that are equivalent to the National standards. Therefore, compliance with the WAAQS and NAAQS indicates compliance with the Oregon standards as well.

Results for NO₂ are presented for both combustion turbine NO_x control scenarios described previously, i.e., the ICT and BACT packages. The analysis indicates that when maximum predicted concentrations are added to the highest monitored values, total concentrations are well below the WAAQS or NAAQS. Concentrations exceeding ambient standards are even less likely when the conservative nature of the assessment methodology is considered.

**TABLE 5.1-29
COMPARISON WITH APPLICABLE AMBIENT AIR QUALITY STANDARDS FOR
NORMAL OPERATIONS**

Pollutant	Averaging Period	Maximum Modeled Concentration	Measured Background Concentration	Maximum Total Concentration	NAAQS	WAAQS
		(µg/m ³)				
PM ₁₀	Annual	0.41	20.0	20.41	50	50
	24-hour	4.97	58.0	62.97	150	150
SO ₂	Annual	0.22	9.1	9.3	80	53
	24-hour	3.02	44.2	47.2	365	263
	3-hour	19.54	96.2	115.7	-	655
	1-hour	37.61	135.2	172.8	1,300	-
NO ₂ (ICT)	Annual	0.84	20.8	21.6	100	100
NO ₂ (BACT)	Annual	1.40	20.8	22.2	100	100
NO ₂	Annual	0.84	20.8	21.6	100	100
CO	8-hour	59.99	5,714.3	5,774.3	10,000	10,000
	1-hour	253.78	7,771.4	8,025.2	40,000	40,000

Total predicted concentrations for worst-case startup or upset conditions are compared to the WAAQS and NAAQS in Table 5.1-30. The analysis indicates that when the maximum predicted concentrations are added to the highest monitored values, total concentrations are less than the WAAQS or NAAQS.

TABLE 5.1-30
COMPARISON WITH APPLICABLE AMBIENT AIR QUALITY STANDARDS FOR
WORST-CASE SHORT-TERM STARTUP OR UPSET CONDITIONS

Pollutant	Averaging Period	Maximum Modeled Concentration	Measured Background Concentration	Maximum Total Concentration	NAAQS	WAAQS	Scenario
		(µg/m ³)					
PM10	24-hour	5	58	63	150	150	1 - startup + train unloading
SO2	24-hour	5	44	49	365	263	1 - startup
	3-hour	61	96	157	-	655	1 - startup
	1-hour	203	135	338	1,300	-	2 - flare upset
CO	8-hour	904	5,714	6,619	10,000	10,000	1 - startup
	1-hour	7,319	7,771	15,090	40,000	40,000	1 - startup

5.1.3.8 Portland Vancouver Ozone Maintenance Area

Oregon Department of Environmental Quality (ODEQ) retained Washington State University (WSU) to conduct an air quality modeling study evaluating the effects of lower Columbia River industrial emissions on ozone formation in the Portland/Vancouver region.⁵ The modeling simulated a July ozone episode in 2015 and considered two future pollutant emission scenarios. One scenario included emissions from potential future industrial growth in the lower Columbia River (similar to the anticipated PMEC emissions). The second scenario did not include any projected future emissions from industries in the lower Columbia River.

A comparison of the ozone concentrations for the two scenarios indicated the industrial emissions had no effect on the simulated peak 8-hr ozone concentration in the Portland/Vancouver area. The results from this modeling analysis show that the anticipated PMEC emissions would not have a large impact on ozone concentrations in the Portland/Vancouver area and would not affect the area's ozone maintenance plan.

5.1.4 REGIONAL AIR QUALITY IMPACT ASSESSMENT

PSD regulations require additional impact analyses to assess the influence of the PMEC on Air Quality Related Values (AQRV) in National Parks and Wilderness Areas (Class I areas). The AQRVs of concern in Class I areas include visibility, soil, flora, fauna and aquatic resources. The additional impact section also provides a qualitative discussion of growth associated with the facility and construction impacts.

⁵ Summary provided in an email from Svetlana Lazarev of ODEQ to Eric Hansen of Geomatrix Consultants. August 9, 2006.

5.1.4.1 Assessment of Air Quality Related Values for Class I Areas

The locations of the Class I areas in relation to the P MEC site are shown in Figure 5.1-7 and Figure 5.1-8. For projects subject to PSD review, an AQRV analysis is required for Federal Class I areas within 100 km of the site. In the Pacific Northwest, the Federal Land Managers (FLMs) and state agencies typically request the model domain be extended to include additional Class I areas within 200 km.

As shown in Table 5.1-31, the Mt. Adams Wilderness Area is located 95 km east of the P MEC site and is the closest Class I area. An AQRV analysis is required for Mt. Adams Wilderness Area, and seven other Class I areas which are within the 200 km expanded range recommended by the FLMs. The Glacier Peak and Three Sisters Wilderness Areas which are just outside 200 km from the site have also been included. Although it is not a Class I area, Ecology and the FLMs requested that the Columbia River Gorge National Scenic Area (CRGNSA) be included in AQRV analyses for informational purposes.

TABLE 5.1-31
CLASS I AREA DISTANCES FROM PROPOSED PROJECT SITE

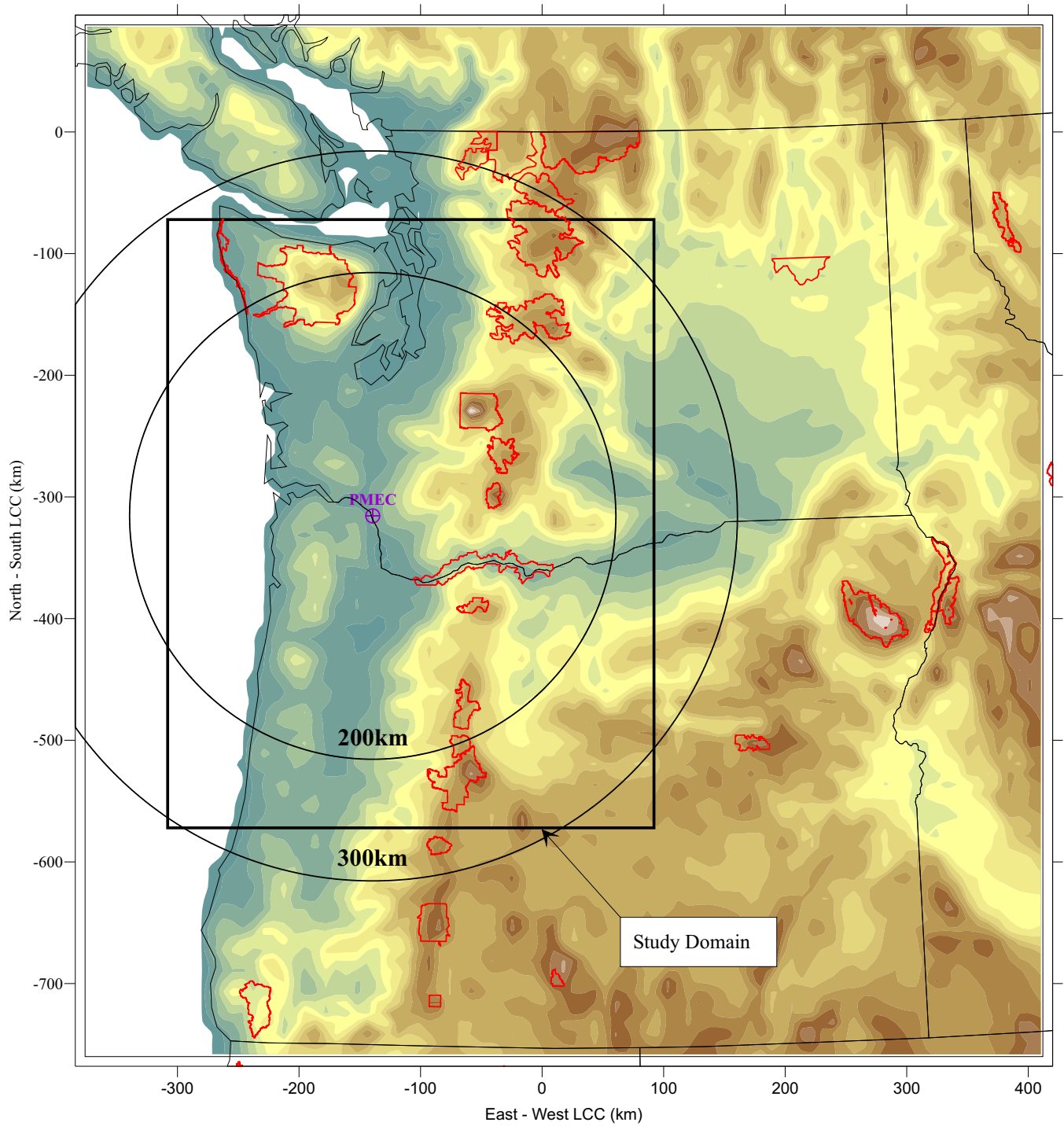
Kalama, Washington

Distances in kilometers

Class I and Other Areas of Interest	Distance
Alpine Lakes Wilderness	176
Glacier Peak Wilderness	240
Goat Rocks Wilderness	108
Mt. Adams Wilderness	95
Mt. Hood Wilderness	102
Mt. Jefferson Wilderness	153
Mt. Rainier National Park	103
Mt. Washington Wilderness	192
Olympic National Park	160
Three Sisters Wilderness	206
Columbia River Gorge Area ¹	62

Note:

1) The Columbia River Gorge National Scenic Area (CRGNSA) is not a Class I area, but is included in the analysis at the request of Ecology and the FLMs.

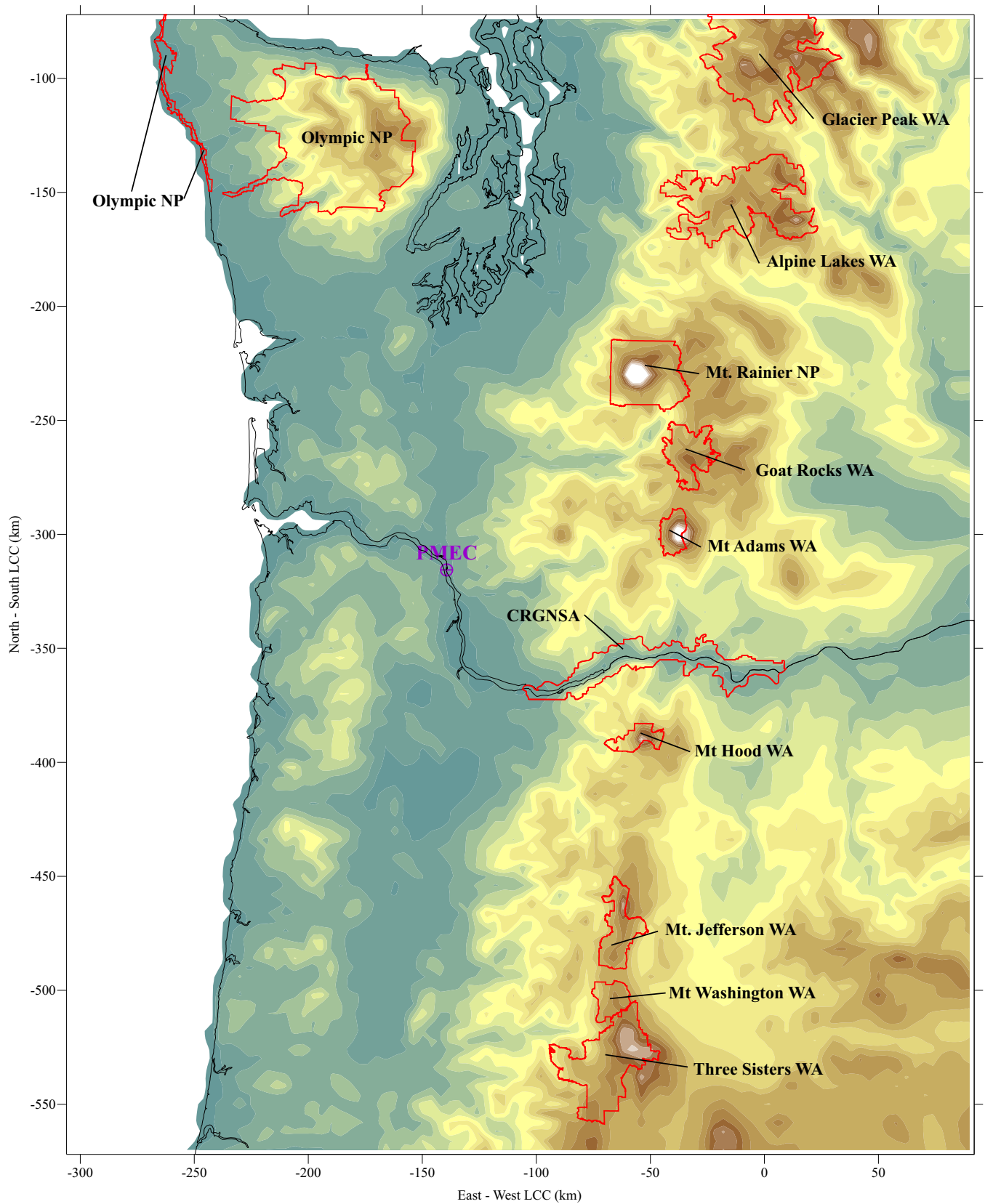


SOURCE: Geomatrix, 2006



Job No. 33758342

Figure 5.1-7
CALPUFF Domain with Respect to UW MM5 4km Domain



SOURCE: Geomatrix, 2006



Job No. 33758342

Figure 5.1-8
CALPUFF Domain, 4km Terrain, Class I Areas and CRGNSA

The AQRVs of concern include visibility, soil, flora, fauna, and aquatic resources. Potential impacts to these AQRVs are characterized based on predictions of total nitrogen and/or sulfur deposition flux, change in light extinction, and pollutant concentrations. Pollutant concentration predictions are also used to assess Class I area increment consumption for pollutants subject to PSD review.

5.1.4.1.1 Model Selection

The USEPA's *Guideline on Air Quality Models* (40 CFR Part 51, Appendix W) hereafter referred to as the *Guideline*) identifies the CALPUFF modeling system as the USEPA's preferred model for long-range transport assessments and for evaluating potential impacts on Class I areas. Features of the CALPUFF modeling system include the ability to consider: secondary aerosol formation; gaseous and particle deposition; wet and dry deposition processes; complex three-dimensional wind regimes; and the effects of humidity on regional visibility.

The CALPUFF modeling system is in a continual process of being upgraded by the model authors. For the simulations in the current AQRV modeling effort, the most recent "beta" release (Version: 6.112, Level: 060412) of CALPUFF was used. This version of the modeling system is proposed by Pacific Northwest states and USEPA Region 10 for regional haze simulations associated with determinations for Best Available Retrofit Technology (BART) eligible sources.⁶

5.1.4.1.2 CALPUFF Modeling Domain

The modeling domain for the CALPUFF simulations is shown in Figure 5.1-7 and Figure 5.1-8. The 400 km-by-500 km domain is large enough to include the Class I areas of interest with some allowance for complex flows that might cause recirculation of the PMEC plumes within western Washington and Oregon. A Lambert conformal coordinate system was used and selected to be a sub-domain of the coordinate system used by the University of Washington (UW) for their MM5 simulations of Pacific Northwest Weather. The UW MM5 simulations were used to construct the three dimensional meteorological data used in the CALPUFF analysis

5.1.4.1.3 CALPUFF Modeling Procedures

The CALPUFF modeling procedures follow the recommendations of the Interagency Agency Workgroup on Air Quality Modeling (IWAQM)⁷ and the Federal Land Managers Air Quality

⁶ Idaho DEQ, 2006. Modeling Protocol for Washington, Oregon, and Idaho: Protocol for the Application of the CALPUFF Modeling System Pursuant to the Best Available Retrofit Technology (BART) Regulations. Obtained from http://www.deq.idaho.gov/air/prog_issues/pollutants/haze_BART_modeling_protocol.pdf.

⁷ IWAQM, 1998. Interagency Workgroup on Air Quality Modeling (IWAQM) Phase 2 Summary Report and Recommendations for Modeling Long Range Transport and Impacts. U.S. EPA, Office of Air Quality Planning and Standards, Research Triangle Park, NC 27711, EPA-454/R-98-019.

Related Values Workgroup (FLAG), outlined in the FLAG Phase I Report (December, 2000).⁸ USEPA endorsed these procedures in advance in the IWAQM Phase II report (December, 1998).

The procedures and defaults recommended by the FLAG Phase I Report were used except where noted in the following discussion. CALPUFF options followed the program defaults for long-range transport (MREG=1). The puff-splitting option (MPLIT=1) with associated default splitting variables was employed for all predictions at the receptors within the Class I areas and the CRGNSA.⁹ The techniques used in the CALPUFF simulations and in the preparation of the meteorological data sets are the same as have been employed in many different PSD applications and previous studies submitted to Ecology.

5.1.4.1.3.1 Emission Rates and PM₁₀ Speciation

CALPUFF simulations were performed using both annual and 24-hour emission rates. The emission rates used in the simulations are summarized in Table 5.1-32 and Table 5.1-33 for the 24-hour and annual averaging periods, respectively. The derivation and assumptions for the criteria pollutant emission rates are provided in Section 5.1.2.

Data characterizing the chemical composition and size distribution of the PM₁₀ emitted are needed for the regional haze assessment using the CALPUFF modeling system. PM₁₀ was divided or “speciated” into components as shown in Table 5.1-32 and Table 5.1-33 using USEPA’s emission factor document AP-42, guidance from the FLMs for gas-turbines,¹⁰ and the vendor estimates. This information was used to estimate the fractions of sulfate (SO₄), elemental carbon (EC), organic carbon (OC), fine crustal mass (PMF) and coarse crustal mass (PMC) that make up the PM₁₀ emitted. This analysis conservatively did not account for any reduction in SO₂ emissions necessary to account for the sulfate assumed in the PM₁₀ fraction emitted from any of the PMEC sources. Thus the potential influence of the PMEC sources on AQRVs related to sulfur is “double-counted” to some degree by the simulations.

The release parameters used in the CALPUFF simulations are shown in Table 5.1-34. Emissions from the two combustion turbine stacks were combined and simulated using the stack parameters of a single turbine stack. The Tank Vent Oxidizer, Auxiliary Boiler, and Flare were each simulated as individual point sources. In order for the simulations to finish in a reasonable time, several of the smaller emission sources were combined together. Emissions from these smaller remaining sources were combined and simulated as a non-buoyant volume source. The location of the volume source was calculated from the average of the individual source coordinates. The volume source release height was calculated in a similar fashion. The initial horizontal and

⁸ FLAG, 2000. Federal Land Managers’ Air Quality Related Values Workgroup (FLAG) Phase I Report (December 2000). Obtained from <http://www.fs.fed.us/r6/qa/natarm/NRISFLAG.html>.

⁹ In order to reduce the large runtimes associated with the puff-splitting option, model predictions at the gridded receptors were obtained without puff-splitting. Such predictions were used for the contour plots presented in this report. The more accurate results with puff-splitting were used in the tables and for comparison with AQRV criteria.

¹⁰ The NPS recommendations are shown on <http://www2.nature.nps.gov/air/permits/ect/ectGasFiredCT.cfm>. This guidance is primarily based on Corio, L.A., and J. Sherwell, 2000. In-Stack Condensable Matter Measurements and Issues. J. Air & Waste Manage. Assoc., Vol 50, Feb. 2000, pp 207-218.

vertical volume source dimensions were calculated from the associated standard deviations of the individual coordinates.

5.1.4.1.4 Chemical Transformations

The NO_x chemistry in CALPUFF depends on the ambient ammonia concentration to establish the equilibrium between gaseous nitric acid and ammonium nitrate. However, ambient ammonia concentrations are not explicitly simulated by CALPUFF and the user must select an appropriate background level. The IWAQM Phase II Recommendations suggest typical ammonia concentrations are: 10 parts per billion (ppb) for grasslands, 0.5 ppb for forests, and 1 ppb for arid lands during warmer weather. These recommendations also suggest higher ammonia concentrations might be assumed in regions with dairy farms or where emissions of ammonia may be higher.

The lowlands areas in western Washington and Oregon contain many areas where dairy farms and other sources cause ammonia emissions to be relatively higher than would be expected in other areas of the United States. For Class I area assessments in western Washington and Oregon it has become a common practice to assume a conservative ammonia background concentration of 17 ppb based on one of the few monitoring studies available where ammonia data were collected. Our experience suggests the use of this conservative concentration ensures the conversion of NO_x to ammonium nitrate is not limited by a lack of ammonia.

Reaction rates in the CALPUFF chemistry algorithms are also influenced by background ozone concentrations. Ozone data was obtained, collected concurrent with the modeled period at National Park Service (NPS) stations within the CALPUFF study area (Marblemount near North Cascades National Park, Tahoma Woods near Rainier National Park, and the Visitor Center near Olympic National Park) as well as from stations both inside and outside the study area operated by Ecology, the British Columbia Ministry of Water, Land, and Air Protection (MWLAP), and the ODEQ. The ozone station locations are shown in Figure 5.1-9. The NPS and MWLAP stations operate all year unlike most of Ecology's and ODEQ's ozone stations, which only operate during the "ozone" season. For periods of missing data outside the ozone season, a conservative background ozone concentration of 40 ppb was used to prevent a limited number of observations from having undue influence throughout the modeling domain.

5.1.4.1.4.1 Meteorological Data

Meteorological data sets were obtained from the University of Washington (UW) based on numerical simulations of Pacific Northwest weather with the Penn State and National Center of Atmospheric Research Mesoscale Model (MM5). The AQRV analysis used three calendar years of hourly MM5 output data from 2003 through 2005. The 2003 and 2004 UW MM5 simulations are based on a 4-km mesh size and over 30 vertical levels. The UW's 12-km mesh size MM5 simulations for 2005 were processed and these data were used to construct the third year of meteorological data. A third year of processed 4-km mesh size MM5 solutions was not available for this analysis. The study domain is a subset of both the UW 4-km mesh and 12-km mesh size MM5 domains as shown in Figure 5.1-7.

**TABLE 5.1-32
SPECIATED 24-HOUR EMISSION RATES FOR AQRV ANALYSIS**

Emission rates in pounds per hour (lb/hr)

Source	SO ₂	NO _X	PM ₁₀	(NH ₄) ₂ -SO ₄	SO ₄	EC	OC	PMF	PMC
Combustion Turbine Generator 1 & 2 ¹	14.7	32.0	24.0	3.0	2.2	6.0	15.0	0.0	0.0
Tank Vent Oxidizer ¹	3.5	19.5	0.7	0.7	0.5	0.0	0.0	0.0	0.0
Auxiliary Boiler ¹	0.4	4.7	0.7	0.2	0.2	0.2	0.3	0.0	0.0
Flare ¹	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Power Block Cooling Towers (drift) ²	0.0	0.0	2.8	0.0	0.0	0.0	0.0	2.8	0.0
Gasification/ASU Cooling Towers (drift) ²	0.0	0.0	1.6	0.0	0.0	0.0	0.0	1.6	0.0
Fugitive PM ₁₀ - ship unloading ³	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Fugitive PM ₁₀ - storage dome transfer point ³	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.1	0.2
Emergency Diesel Generator ⁴	0.1	3.1	0.1	0.01	0.01	0.07	0.0	0.0	0.0
Emergency Diesel Fire Pump ⁴	0.0	0.3	0.0	0.00	0.00	0.01	0.0	0.0	0.0

Notes:

- 1) Preliminary engineering estimates for ammonium sulfate is 3 lb/hr for each turbine. For the Tank Vent Oxidizer and Auxiliary Boiler, a 30 percent conversion of SO₂ to ammonium sulfate was assumed. Five percent conversion was assumed for the Flare. Based on NPS recommendations for gas-fired turbines, 30% of the PM₁₀ is assumed to be filterable and consist of EC. The condensable fraction is assumed to consist of ammonium sulfate from conversion of SO₂ and the remainder is OC.
- 2) All PM₁₀ was assumed to consist of fine crustal mass.
- 3) Size fractions for materials handling are based on Chapter 13 of USEPA's emission factor document AP-42 (Table 13.2.4.3).
- 4) PM₁₀ condensable fraction in USEPA's emission factor document AP-42 Chapter 3.4.2 is assumed to be ammonium sulfate and the remainder EC.

**TABLE 5.1-33
SPECIATED ANNUAL EMISSION RATES FOR AQRV ANALYSIS**

Emission rates in tons per year (TPY)

Source	SO ₂	NO _X	PM ₁₀	(NH ₄) ₂ -SO ₄	SO ₄	EC	OC	PMF	PMC
Combustion Turbine Generator 1 & 2 ¹	64.55	147.0	105.1	13.14	9.56	26.28	65.70	0.00	0.00
Tank Vent Oxidizer ¹	15.86	26.4	0.9	0.88	0.64	0.00	0.00	0.00	0.00
Auxiliary Boiler ¹	0.41	5.1	0.7	0.25	0.18	0.18	0.28	0.00	0.00
Flare ¹	1.43	14.6	1.7	0.15	0.11	0.42	1.11	0.00	0.00
Power Block Cooling Towers (drift) ²	0.0	0.0	12.2	0.00	0.00	0.00	0.00	12.19	0.00
Gasification/ASU Cooling Towers (drift) ²	0.0	0.0	7.1	0.00	0.00	0.00	0.00	7.11	0.00
Fugitive PM ₁₀ - ship unloading ³	0.0	0.0	0.22	0.00	0.00	0.00	0.00	0.07	0.15
Fugitive PM ₁₀ - storage dome transfer point ³	0.0	0.0	0.06	0.00	0.00	0.00	0.00	0.02	0.04
Emergency Diesel Generator ⁴	0.05	1.84	0.05	0.01	0.00	0.04	0.00	0.00	0.00
Emergency Diesel Fire Pump ⁴	0.01	0.20	0.01	0.00	0.00	0.01	0.00	0.00	0.00

Notes:

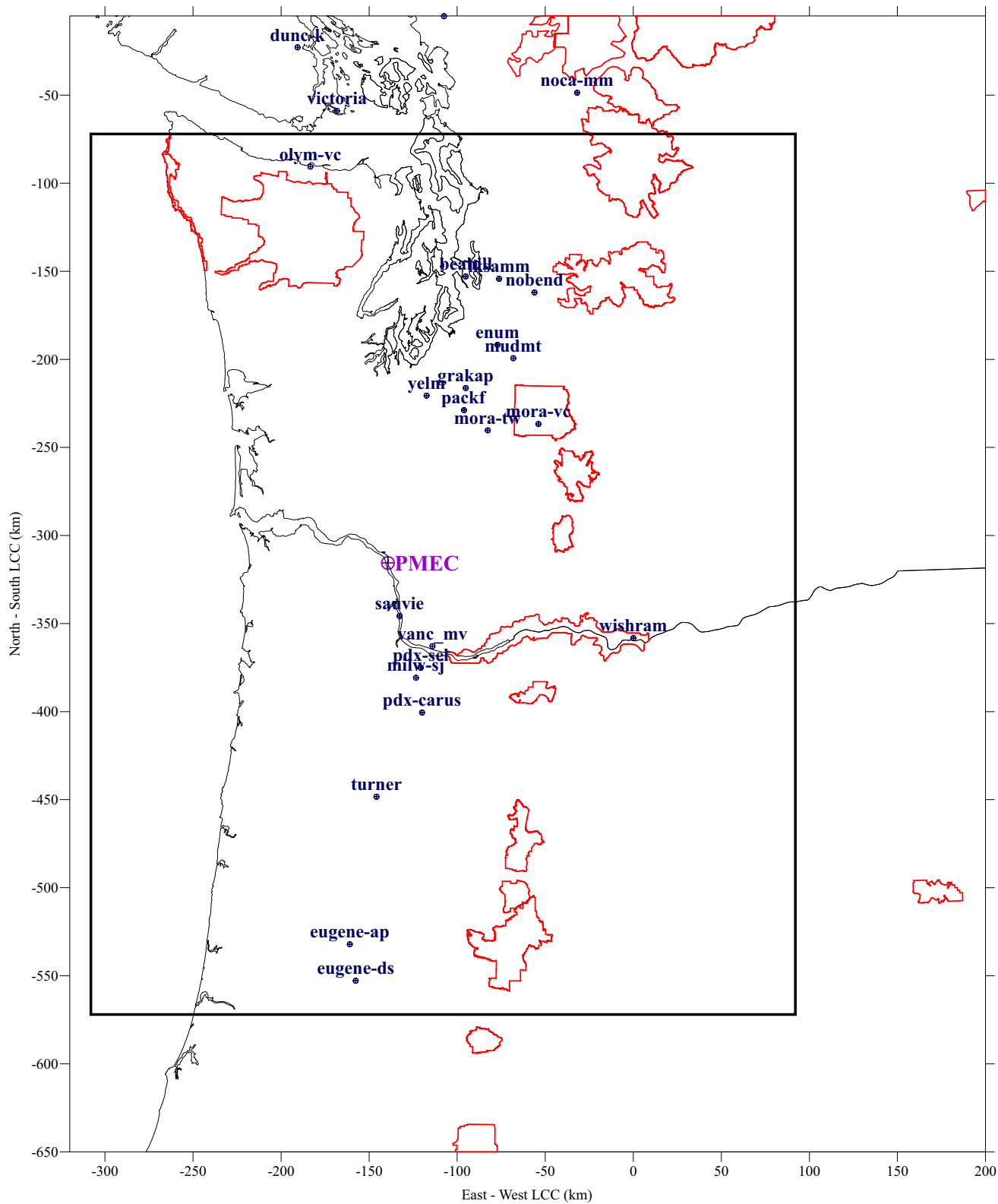
- 1) Preliminary engineering estimates for ammonium sulfate is 3 lb/hr for each turbine. For the Tank Vent Oxidizer and Auxiliary Boiler, a 30 percent conversion of SO₂ to ammonium sulfate was assumed. Five percent conversion was assumed for the Flare. Based on National Park Service (NPS) recommendations for gas-fired turbines, 30% of the PM₁₀ is assumed to be filterable and consist of EC. The condensable fraction is assumed to consist of ammonium sulfate from conversion of SO₂ and the remainder is OC.
- 2) All PM₁₀ was assumed to consist of fine crustal mass.
- 3) Size fractions for materials handling are based on Chapter 13 of USEPA's emission factor document AP-42 (Table 13.2.4.3).
- 4) PM₁₀ condensable fraction in USEPA's emission factor document AP-42 Chapter 3.4.2 is assumed to be ammonium sulfate and the remainder EC.

**TABLE 5.1-34
CALPUFF RELEASE PARAMETERS FOR AQRV ANALYSIS**

Source	Type	X (km) ¹	Y(km) ¹	Elevation (m) ²	Release Height (m)	Exit Temp. (K)	Exit Velocity (m/s)	Stack Diameter (m)	Horiz. Std. Dev. (m)	Vertical Std. Dev. (m)
Combustion Turbine Generator 1 & 2	Stack	-139.343	-315.651	120.2	45.7	394.3	20.6	6.10		
Tank Vent Oxidizer	Stack	-139.291	-315.495	121.4	64.0	579.8	8.5	1.83		
Auxiliary Boiler	Stack	-139.356	-315.669	120.1	12.2	422.0	9.7	1.52		
Flare	Stack	-139.572	-315.374	124.6	30.5	1144.3	0.2	15.24		
Rest of Sources ³	Volume	-139.377	-315.622	120.8	15.9				9.5	156.1

Notes:

- 1) Lambert conformal coordinates with an origin of 49N and 121W and standard latitudes of 30N and 60N.
- 2) Bilinear interpolated elevation from 4-km mesh size terrain file used in the CALPUFF simulations.
- 3) Combined volume source representing cooling towers, diesel engines and fugitive dust associated with materials handling.



SOURCE: Geomatrix, 2006



Job No. 33758342

Ozone Monitoring Stations Within and Near CALPUFF Domain

Figure 5.1-9



Pacific Mountain Energy Center
Kalama, Washington

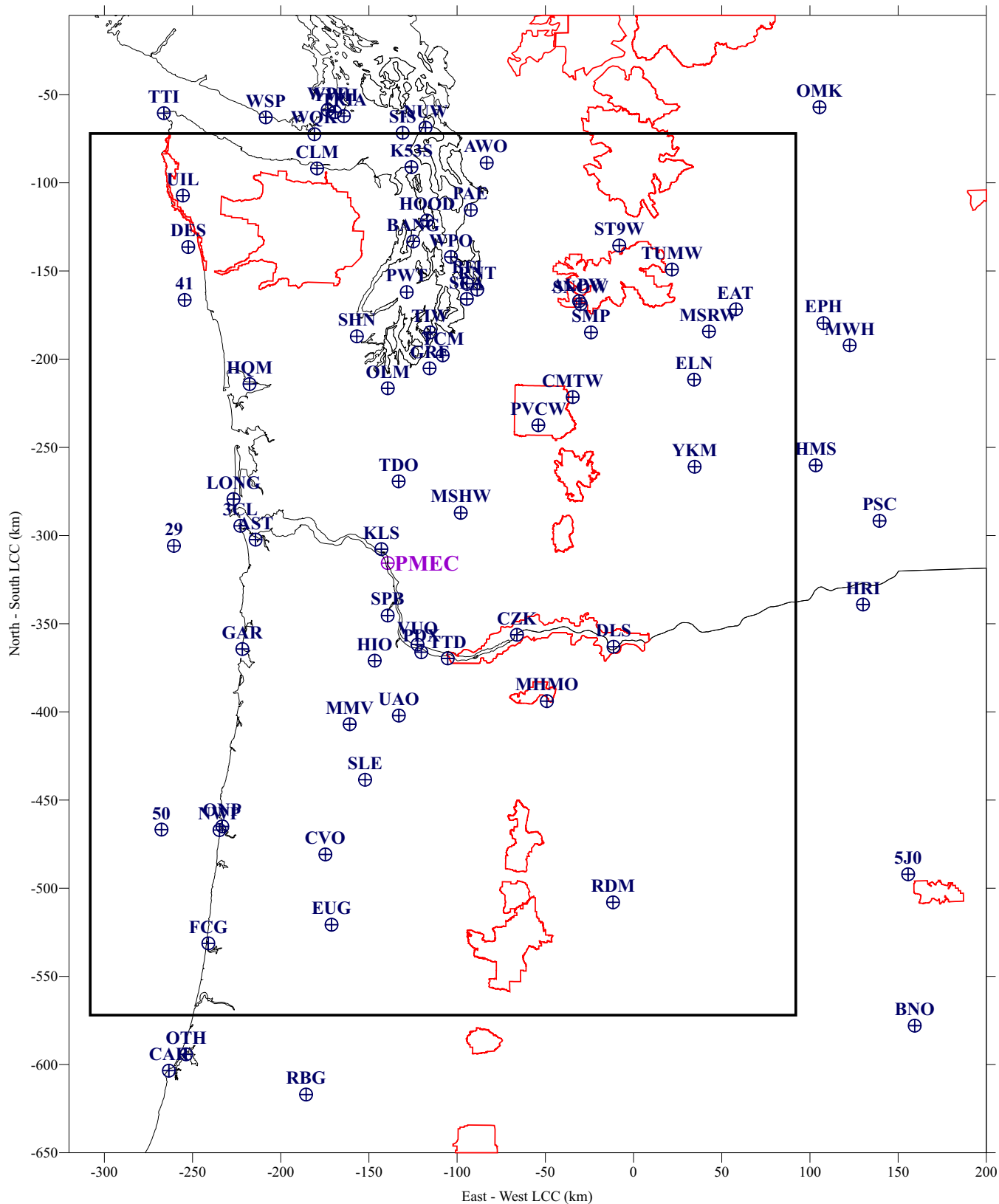
CALMET, the meteorological preprocessor component of the CALPUFF system, was used to combine the MM5 simulation data, surface observations, terrain elevations, and land use data into the format required by the dispersion modeling component CALPUFF. In addition to specifying the three-dimensional wind field, CALMET also estimates the boundary layer parameters used to characterize diffusion and deposition by the dispersion model. CALMET default options were used except where noted in Table 5.1-35, Non Default CALMET Options. Major features of the CALMET application and input data preparation are as follows:

- The 4-km mesh size MM5 winds for January 2003 through December 2004, and 12-km mesh size MM5 winds for 2005 were used to initialize the three-dimensional wind field predictions. The data recovery for the MM5 archive was greater than 99 percent. Periods of missing data were filled by interpolation and by repeating the previous day for longer periods.
- CALMET objective procedures were used with local terrain and land use data to adjust the MM5 12-km wind fields down to a 4-km mesh size grid. Since the CALMET terrain is less smooth than needed by MM5 for the same mesh size, these procedures also adjust the 4-km mesh size MM5 winds to some extent. The pressure-based vertical level MM5 fields were reduced and layer-averaged resulting in 10 vertical levels from the surface to 4,000 m.
- The “no observations” option (NoObs = 1) in CALMET was used to extract hourly precipitation and upper air temperature lapse rates from the MM5 data set. Other switches were set to use the MM5 surface temperature and relative humidity rather than using observations whose locations are usually in the lowland areas of the modeling domain.
- Local observed wind speed and wind direction were not used in the preparation of the wind fields. The wind fields used in the AQRV analysis depend solely on the MM5 winds and the objective procedure applied by CALMET. This was accomplished by selecting the non-default interpolation options shown in Table 5.1-35.
- Surface observations with and near the study domain were used to provide hourly cloud cover and ceiling height data. The source of surface meteorological data was the UW's Pacific Northwest observation archive.¹¹ The stations selected from the archive are shown in Figure 5.1-10. These surface stations include all the METAR stations near the domain, plus some other Coast Guard and SNOTEL stations in areas where METAR data are sparse. Note, only the stations with cloud cover and ceiling height actually influence the CALMET runs using the options in Table 5.1-35. The other stations were included in case it was necessary to change the CALMET options or compare MM5/CALMET winds to observed winds at these locations.

¹¹ The UW archive can be examined at <http://www.atmos.washington.edu/data>. The archive contains Pacific Northwest observations from 1996 to present.

**TABLE 5.1-35
NON DEFAULT CALMET OPTIONS**

CALMET Variable	Selected Value	Rationale
noobs	1	Use MM5 upper air data.
npsta	-1	Use MM5 precipitation data.
iextrp	-1	Since we would use MM5 for upper levels, do not extrapolate observed surface winds aloft. (Note, the similarity profile method (iextrp = -4) also is not applicable in complex terrain.)
rmin2	-1	Not used, since iextrp=-1 and noobs=1
iprog	14	Use MM5 as a first guess but allow CALMET to adjust for terrain. Note CALMET terrain for the same mesh size is more resolved than the MM5 terrain, because the later is smoothed to reduce the noise in the numerical solutions.
terrad	12 for 12km MM5 mesh; 4 for 4km MM5 mesh	Allow CALMET to adjust winds to local terrain for about 1 MM5 grid point.
r1 & r2	1.e-6	Do not allow CALMET to use the observed winds. We would use the MM5 solutions and CALMET terrain adjustment procedures. We could also do this with noobs=2, but we do not want the CALMET algorithm for cloud cover.
nsmth	1-4 for 12km MM5 mesh; 1-2 for 4km MM5 mesh	Do not smooth the winds too much and smooth the 4km MM5 based winds less than the 12km MM5 winds.
niter	50 for 12km MM5 mesh; 2 for 4km MM5 mesh	There is divergence in complex terrain that should be reflected in the 4km MM5 solutions. Do not get rid of all this divergence, but also do not let CALMET introduce divergence in the 12km MM5 solutions.
irhprog	1	Use MM5 relative humidity
itprog	2	Use MM5 surface temperatures
icoare	0	Original OCD delta T method for over water. Not used as indicated below.
jwat1 & jwat2	100	Forces CALMET's to treat the boundary layer over water the same as over land.
sigmap	12 for 12km MM5 mesh; 4 for 4km MM5 mesh	A larger default radius of interpolation results in "bull-eyes" of precipitation due to the CALMET weighting scheme applied to the MM5 precipitation predictions. Set the radius to the MM5 mesh size.



Job No. 33758342

Figure 5.1-10
Surface Meteorological Sites Within or Near CALPUFF Domain

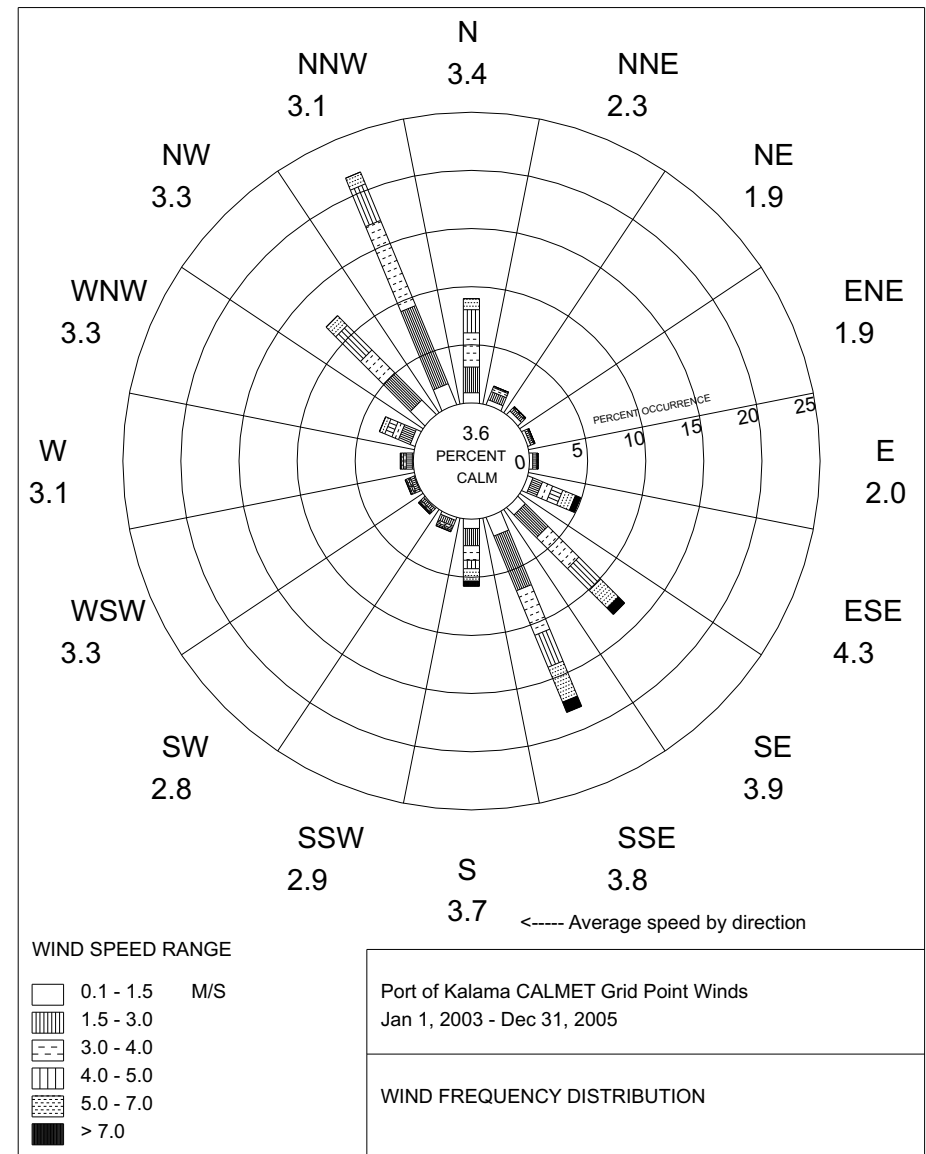
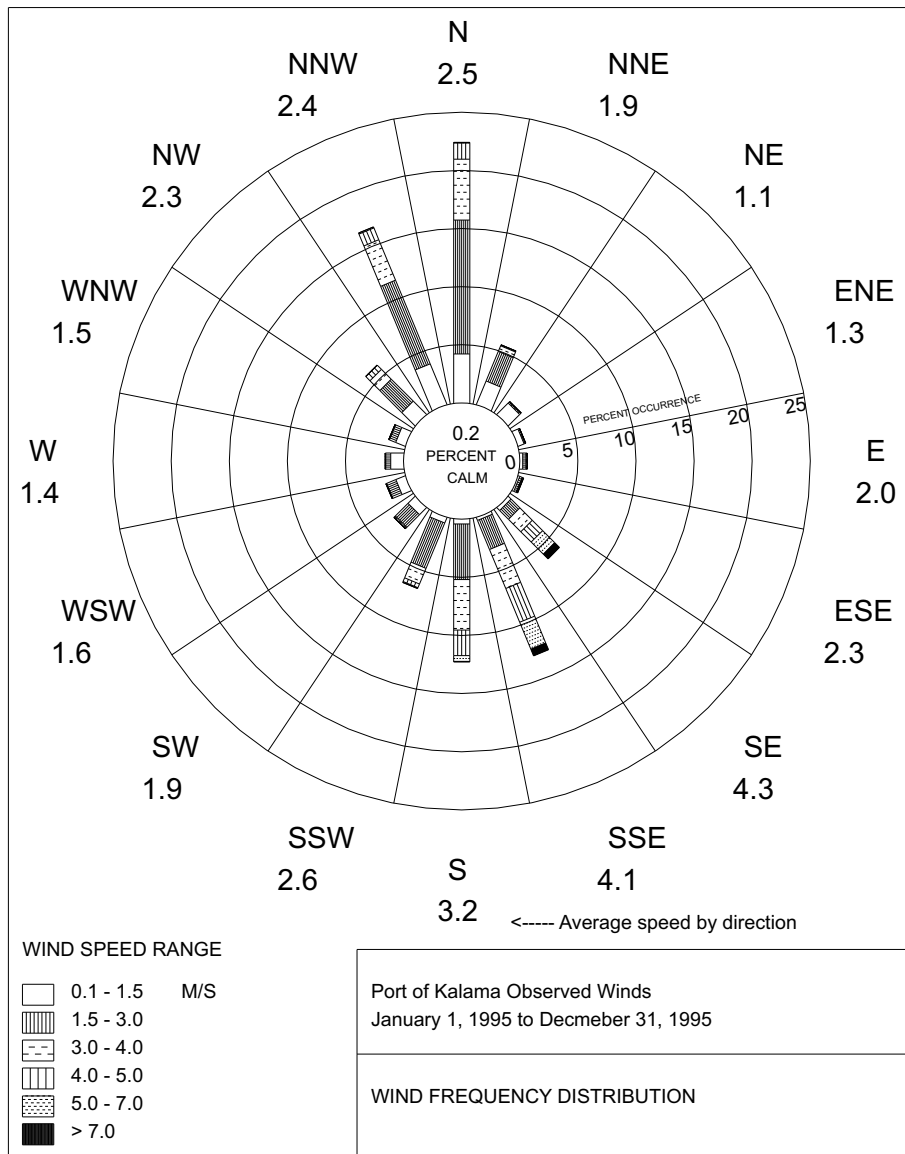
- CALMET options were selected to use less smoothing and less divergence reduction for the simulations based on the 4-km mesh size MM5 data. Although the 4-km terrain in MM5 is smoothed and less representative than the 4-km terrain used by CALMET, the CALMET terrain adjustment algorithms should have less influence when using the 4-km MM5 data than when using the 12-km MM5 data. Also divergence is expected in complex terrain and should not necessarily be removed by CALMET when predicted by MM5.
- The new over water dispersion and boundary layer options included in CALPUFF version 6 were not selected for the simulations. Such options require the MM5 data be reprocessed from the raw UW archives so additional MM5 variables can be passed through to CALMET. Such data are not yet available for this analysis. Options were selected such that the treatment of over water conditions used the same routines as over land, except the variables characterizing the surface are appropriate for the ocean. The assumptions result in a near neutral boundary layer over the ocean.

Selected hours of the three-year CALMET/MM5 three-dimensional data set were examined by extracting data from the CALMET output files and plotting the meteorological fields. Wind vector plots were also prepared for four days (one in each year and at least one in each season), three times on each day (4am, 10am, and 4pm), and three vertical levels for each day and time. These vector plots were provided to Ecology¹² and are included in the computer files supporting this application.

Wind roses of surface winds were prepared for meteorological stations of interest and predictions at nearby CALMET grid points to assess the agreement between the simulated and observed winds. CALMET and observed winds at Astoria, Salem, Troutdale, The Dalles, Kelso, and Portland were used for these comparisons. Although for different periods, a wind rose was constructed for the CALMET winds predicted at the PMEC site during 2003-2005 to compare with observed annual winds during 1995. The 1995 Port of Kalama meteorological data were used as the basis for the local impact assessment discussed in Section 5.1.3. These wind roses were also provided to Ecology for review of the CALMET data sets.

Figure 5.1-11 CALMET Predicted versus Observed Surface Winds compares surface winds predicted by CALMET during 2003-2005 to observed winds collected at the Port of Kalama during 1995. The annual average predicted and observed wind speeds were 3.3 m/s and 2.7 m/s, respectively. Although these are different periods, the annual wind roses should be similar and show the same general terrain channeling. The CALMET/MM5 predicted winds capture the main features of the observed annual surface winds near the site, although the predicted prevailing winds are not quite as oriented along a north-to-south axis. The smoothed 4-km mesh size CALMET terrain is less severe and the winds are not channeled to the extent observed at the Port of Kalama. Local winds are expected to be more severely channeled near the surface. Plumes for the important sources at PMEC are usually several hundred meters aloft where the CALMET/MM5 winds are thought to be representative of region flow.

¹² "Analysis of calmet winds for ENW-IGCC at Port of Kalama". Email from Ken Richmond, Geomatrix to Clint Bowman, Ecology on July 7, 2006. The files were supplied via the Geomatrix ftp site.



SOURCE: Geomatrix, 2006



Geomatrix

Job No. 33758342

Figure 5.1-11
CALMET Predicted vs Observed Surface Winds Near Kalama

5.1.4.1.4.2 Elevation Data and Receptor Network

The CALPUFF dispersion model simulations assessed AQRVs at discrete receptors within each Class I area using the receptor locations provided by the NPS.¹³ Receptor elevations at these locations were calculated from the 4-km mesh size terrain using the same methods used by CALMET to develop the wind fields and by CALPUFF to estimate the height of puffs above terrain. Although the receptor elevations provided with the NPS receptors are likely more representative of the actual terrain at the receptor locations, consistency with the meteorology used in the simulations was deemed to be more important than accurately reflecting the terrain heights. The CALPUFF modeling system bases many puff properties on the height above ground, which is calculated using the same terrain grid used by CALMET to alter the winds and produce a mass consistent wind field that reflects the terrain. Because the use of terrain elevations other than those in the model terrain grid introduces potential inconsistencies, elevations in the model terrain grid were used in the predictions.

In addition to the discrete receptors, a receptor grid with 4-km spacing was also used throughout the CALPUFF modeling domain for AQRV predictions. The 4-km mesh size receptors were used to construct plots showing the spatial variation of the calculated parameters throughout the modeling domain. Such plots were used for diagnostic purposes, to develop the figures presented in this PSD application to EFSEC, and to provide the usually requested spatial information for the FLMs review.

The NPS receptor files do not include the CRGNSA. Receptor locations within the CRGNSA were based on a 2-km mesh. These receptors were added to the NPS discrete receptors in the simulations. Terrain elevations for the receptors within the CRGNSA were also based on the CALMET 4-km mesh size terrain.

Land use and terrain data were prepared from the North American 30 second data sets that accompany the CALPUFF modeling system using the tools included in the system. The resulting 4-km mesh size terrain grid was contoured and is shown in Figure 5.1-8. As described above, the same terrain grid used to develop the CALMET wind fields and used internally by CALPUFF was also used to obtain receptor and source base elevations.

5.1.4.1.4.3 AQRV Calculation Procedures

The CALPUFF modeling system was used to predict criteria pollutant concentrations, total deposition fluxes, and light extinction coefficients attributable to project emissions in regional Class I areas. These parameters were calculated from CALPUFF output files using the post-processor programs CALPOST and POSTUTIL.

Predictions of NO_x, SO₂, and PM₁₀ concentrations in the Class I areas of interest were extracted from the annual and 24-hour emission cases using the CALPOST post-processor. PM₁₀ concentration estimates include both primary and secondary aerosols and account for the

¹³ The NPS receptors can be found at <http://www2.nature.nps.gov/air/Maps/Receptors/index.cfm>.

molecular weights of each resulting compound. The conversion to account for molecular weight and summing of species are accomplished using the POSTUTIL processor. Total nitrogen and sulfur deposition fluxes are similarly calculated by summing and converting the various species included in the wet and dry deposition CALPUFF output files. The nitrogen deposition fluxes include the nitrogen from the background ammonia to some extent. For comparison to FLM deposition criteria, the fluxes were converted to kilograms per hectare per year.

The potential for PMEC emissions to contribute to regional haze was predicted using 24-hour average extinction coefficients as a measure of visibility degradation. The analysis assessed the potential for direct particle emissions and secondary aerosols formed from the gases emitted by the PMEC to reduce visual ranges in Class I areas. The procedure assumes regional visibility degradation is primarily due to light extinction caused by scattering by fine particles including sulfates and nitrates, and by light absorption from soot particles.

In the FLAG Phase I Report, the FLMs recommend that a five percent change in extinction be used to indicate a “just perceptible” change to a landscape. Extinction coefficients were calculated from the CALPUFF output files using the post-processing program CALPOST. CALPOST calculates extinction coefficients from concentrations of aerosols directly emitted, sulfate concentrations, nitrate concentrations, and relative humidity. CALPOST can also summarize expected changes to background extinction as a function of hourly relative humidity at each receptor and assumed background aerosol concentrations.

The general equation applied in CALPOST divides the extinction coefficient into two components as follows:

$$b_{ext} = b_{SN}f(RH) + b_{dry} \quad (1)$$

where b_{ext} is the extinction coefficient (inverse megameters or Mm^{-1}), $f(RH)$ is the relative humidity adjustment factor, b_{SN} is the sulfate and nitrate or hygroscopic portion of the extinction coefficient (Mm^{-1}), and b_{dry} is the non-hygroscopic portion of the extinction coefficient (Mm^{-1}). The hygroscopic portions of the extinction budget are calculated from the sulfate and nitrate concentrations predicted by CALPUFF according to:

$$b_{SN} = 3[(NH_4)2SO_4 + NH_4NO_3] \quad (2)$$

where the sulfate and nitrate concentrations have units of $\mu g/m^3$ and are converted for the change in molecular weight due to the assumed chemical form of the aerosol. In the simulations, relative humidity was limited to 95 percent as recommended in guidance from the Ecology and the USEPA for estimates of background visibility.¹⁴ The portion of the extinction coefficient that does not vary with humidity is calculated from:

$$b_{dry} = 4[OC] + 1[Crustal Mass] + 0.6[Coarse Mass] + 10[EC] + b_{Ray} \quad (3)$$

¹⁴ USEPA, 2003. Guidance of Estimating Natural Visibility Conditions under the Regional Haze Rule. U.S. EPA Office of Air Quality Planning and Standards, Research Triangle Park, NC 27711, EPA-454/B-03-005, September 2003.

where [OC] is the organic carbon portion of the $PM_{2.5}$, [Crustal Mass] is the crustal portion ($PM_{2.5}$ that cannot be classified as organic or elemental carbon) of the $PM_{2.5}$, [Coarse Mass] is the portion of the mass between $PM_{2.5}$ and PM_{10} , [EC] is the elemental carbon (soot) portion of $PM_{2.5}$, and b_{Ray} is extinction due to Rayleigh scattering assumed to be 10 Mm^{-1} . Concentrations in Equation 3 also have units of $\mu\text{g}/\text{m}^3$.

5.1.4.1.4.4 Baseline AQRV Data

Soils, vegetation and aquatic resources in Class I areas are potentially influenced by nitrogen and sulfur deposition. Nitrogen and sulfur deposition occur through both wet and dry processes and both direct emissions and secondary aerosols formed during transport from a source to a Class I area can contribute to total deposition. The FLMs believe that the effects caused by pollutant loading on these AQRVs are nonlinear and they request that model predictions be added to conservative background estimates. The FLMs assess potential effects on a case-by-case basis using cumulative total deposition flux estimates. Nitrogen and sulfur deposition background estimates are summarized in Table 5.1-36.

For background visibility at all Class I areas of interest, the FLAG western U.S. defaults were used for the hygroscopic (0.6 Mm^{-1}), dry (4.5 Mm^{-1}), and Rayleigh (10 Mm^{-1}) scattering portions of the extinction coefficient. These defaults were applied within CALPOST using the following options: MVISBK = 2, BKSO4=0.2, BKSOIL=4.5 and BEXTRAY=10.

The background aerosol concentrations used to characterize background extinction in the CRGNSA are shown in Table 5.1-37. The CRGNSA is not a Class I area and has both regional and industrial sources located within its boundaries. Based on guidance from the USDA Forest Service, background estimates for aerosol concentrations in the CRGNSA were based on the average of observations for the 20 percent days with the lowest reconstructed extinction coefficients. Such aerosol concentrations result in a conservative, but more realistic characterization of background extinction in the CRGNSA than the FLAG defaults for “natural” background.

5.1.4.1.5 AQRV Modeling Results

The CALPUFF modeling system was used to predict concentrations of NO_x , SO_2 , and PM_{10} in regional Class I areas and the CRGNSA using the three year regional meteorological data set. The CALPUFF simulations used the emission rates presented in Table 5.1-32 and Table 5.1-33, and the source release parameters shown in Table 5.1-34. The resulting CALPUFF output files were post-processed to extract the necessary variables for comparison with the FLM Class I AQRV criteria.

**TABLE 5.1-36
EXISTING BACKGROUND DEPOSITION IN CLASS I AREAS AND CRGNSA**

Deposition fluxes in kilograms per hectare per year (kg/ha/yr)

Class I Area ¹	Total Nitrogen Deposition	Total Sulfur Deposition
Alpine Lakes Wilderness	5.2	7.2
Glacier Peak Wilderness	5.8	8.0
Goat Rocks Wilderness	9.0	11.8
Mt. Adams Wilderness	9.0	10.8
Mt. Hood Wilderness	5.4	8.6
Mt. Jefferson Wilderness	1.8	4.0
Mt. Rainier National Park	2.4	3.1
Mt. Washington Wilderness	2.6	5.0
Olympic National Park	2.0	5.6
Three Sisters Wilderness	3.6	5.6
CRGNSA ²	10.0	12.0

Notes:

¹ Background deposition fluxes for USDA Forest Service areas were developed using a scientific consensus process from a 1990 workshop. These data are considered to represent a conservative upper limit for these areas – they are not spatially or temporally averaged values. The deposition fluxes are reported in Table 11 of *Guidelines for Evaluating Air Pollution Impacts on Class I Areas in the Pacific Northwest*. USDA Forest Service, General Technical Report PNW-GTR-299, May 1992 (Peterson, J., et al., 1992).

National Park Service data are based on 1995-2000 National Acid Deposition Program annual average deposition values collected at the Hoh Ranger Station (Olympic) and Pack Forest (Mt. Rainier) monitoring sites.

For all areas, total background deposition is conservatively assumed to be double the reported wet deposition flux to account for additional dry and occult (cloud water) deposition processes.

² The CRGNSA is not a Class I area. Background data for the CRGNSA are from Bob Bachman (USDA Forest Service) in email of July 12, 2001 based on Lichen monitoring data.

TABLE 5.1-37
BACKGROUND AEROSOL CONCENTRATIONS FOR THE CRGNSA

Concentrations are in micrograms per cubic meter ($\mu\text{g}/\text{m}^3$)

Aerosol Species	Spring	Summer	Autumn	Winter
Ammonium Sulfate	0.553	0.928	0.556	0.319
Ammonium Nitrate	0.231	0.172	0.258	0.244
Fine Crustal Mass (PMF)	0.241	0.295	0.294	0.191
Organics (OC)	0.849	0.856	0.985	0.897
Elemental Carbon (EC)	0.169	0.172	0.220	0.240
Coarse Mass (PMC)	4.835	5.810	3.632	5.114

Note:

¹ Based on the 20 percent days with the best visibility at the Wishram monitoring station from 1993 through 2000. The data were provided by Bob Bachman of the USDA Forest Service in an email to Ken Richmond of Geomatrix on February 26, 2001.

5.1.4.1.5.1 Criteria Pollutant Concentrations

Table 5.1-38 summarizes the predicted maximum criteria pollutant concentrations and compares them to the Class I SILs¹⁵ and the Class I PSD increments. Concentrations lower than the SILs indicate insignificant consumption of the Class I increment. Such concentrations are also much lower than pollutant levels thought to adversely affect vegetation.¹⁶ As shown in Table 5.1-38, the CALPUFF simulations indicate criteria pollutant concentrations attributable to PMEC are less than the Class I SILs and the increments in all Class I areas and the CRGNSA.

Contour plots of model predicted maximum concentrations were constructed for several of the applicable pollutants and averaging periods to examine the spatial variation of the predictions across the study domain. Figures 5.1-12 through Figure 5.1-14 present the predicted maximum concentrations for 24-hour PM_{10} , 3-hour SO_2 , and annual NO_x . The annual predictions tend to follow the Columbia River near the site, extending north into the western Washington lowlands, and south into the Willamette Valley. The contours also show the influence of regional flow up the Columbia River Gorge and out the mouth of the Columbia River near Astoria. The maximum predictions for the shorter 3- and 24-hour averaging periods occur close to the PMEC site and are less influenced by the prevailing regional wind patterns.

¹⁵ At this point, there are two sets of Class I SILs, those proposed by USEPA and those recommended by the FLMs. These proposed and recommended SILs were obtained from the Federal Register, Vol. 61, No. 143, p. 38292, July 23, 1996.

¹⁶ Guidelines for Evaluating Air Pollution Impacts on Class I Areas in the Pacific Northwest. USDA Forest Service, General Technical Report PNW-GTR-299, May 1992 (Peterson, J., et al., 1992).

TABLE 5.1-38
PREDICTED CLASS I AREA AND CRGNSA CRITERIA
POLLUTANT CONCENTRATIONS

Concentrations in micrograms per cubic meter ($\mu\text{g}/\text{m}^3$)

Class I and Other Areas of Interest	Maximum Predicted Concentration					
	NO ₂ ¹	PM ₁₀		SO ₂		
	Annual Average	24-Hour Average	Annual Average	3-Hour Average	24-Hour Average	Annual Average
Alpine Lakes WA	0.0005	0.0479	0.0014	0.0274	0.0073	0.0004
CRGNSA ⁴	0.0118	0.1610	0.0155	0.1908	0.0586	0.0066
Glacier Peak WA	0.0002	0.0237	0.0006	0.0128	0.0037	0.0002
Goat Rocks WA	0.0010	0.0292	0.0018	0.0442	0.0117	0.0006
Mt. Adams WA	0.0020	0.0496	0.0046	0.0709	0.0181	0.0015
Mt. Hood WA	0.0026	0.0586	0.0054	0.0864	0.0246	0.0018
Mt. Jefferson WA	0.0006	0.0455	0.0025	0.0284	0.0105	0.0006
Mt. Rainier NP	0.0015	0.0640	0.0020	0.0981	0.0212	0.0008
Mt. Washington WA	0.0002	0.0322	0.0018	0.0170	0.0059	0.0003
Olympic NP	0.0006	0.0369	0.0013	0.0446	0.0110	0.0004
Three Sisters WA	0.0002	0.0370	0.0018	0.0138	0.0058	0.0003
<i>Class I Area Max. Conc. ⁴</i>	<i>0.0026</i>	<i>0.0640</i>	<i>0.0054</i>	<i>0.0981</i>	<i>0.0246</i>	<i>0.0018</i>
<i>USEPA Proposed SIL²</i>	<i>0.1</i>	<i>0.3</i>	<i>0.2</i>	<i>1</i>	<i>0.2</i>	<i>0.1</i>
<i>FLM Recommended SIL²</i>	<i>0.03</i>	<i>0.27</i>	<i>0.08</i>	<i>0.48</i>	<i>0.07</i>	<i>0.03</i>
<i>Class I Area PSD Increment³</i>	<i>2.5</i>	<i>8</i>	<i>4</i>	<i>25</i>	<i>5</i>	<i>2</i>

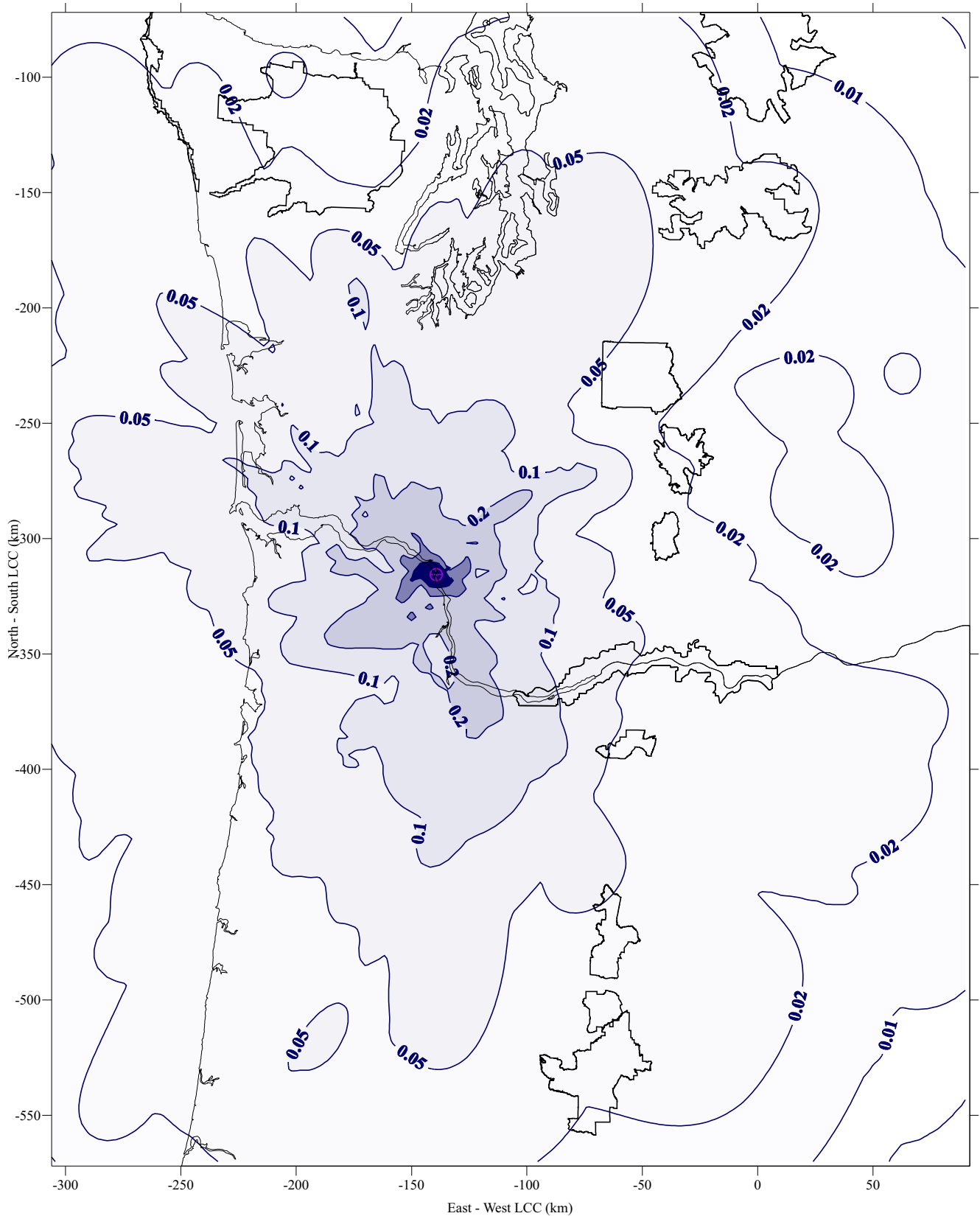
Notes:

¹NO_x was conservatively assumed to be 100 percent converted to NO₂.

²SIL = Significant Impact Level; USEPA proposed and FLM recommended from the Federal Register, Vol. 61, No. 142, p. 38292, July 23, 1996.

³PSD = Prevention of Significant Deterioration; from 40 CFR 52.21(c), adopted by reference in WAC 173-400-720(4)(a)(v)

⁴The CRGNSA is not a Class I area, but is included in the analysis at the request of Ecology and the FLMs.

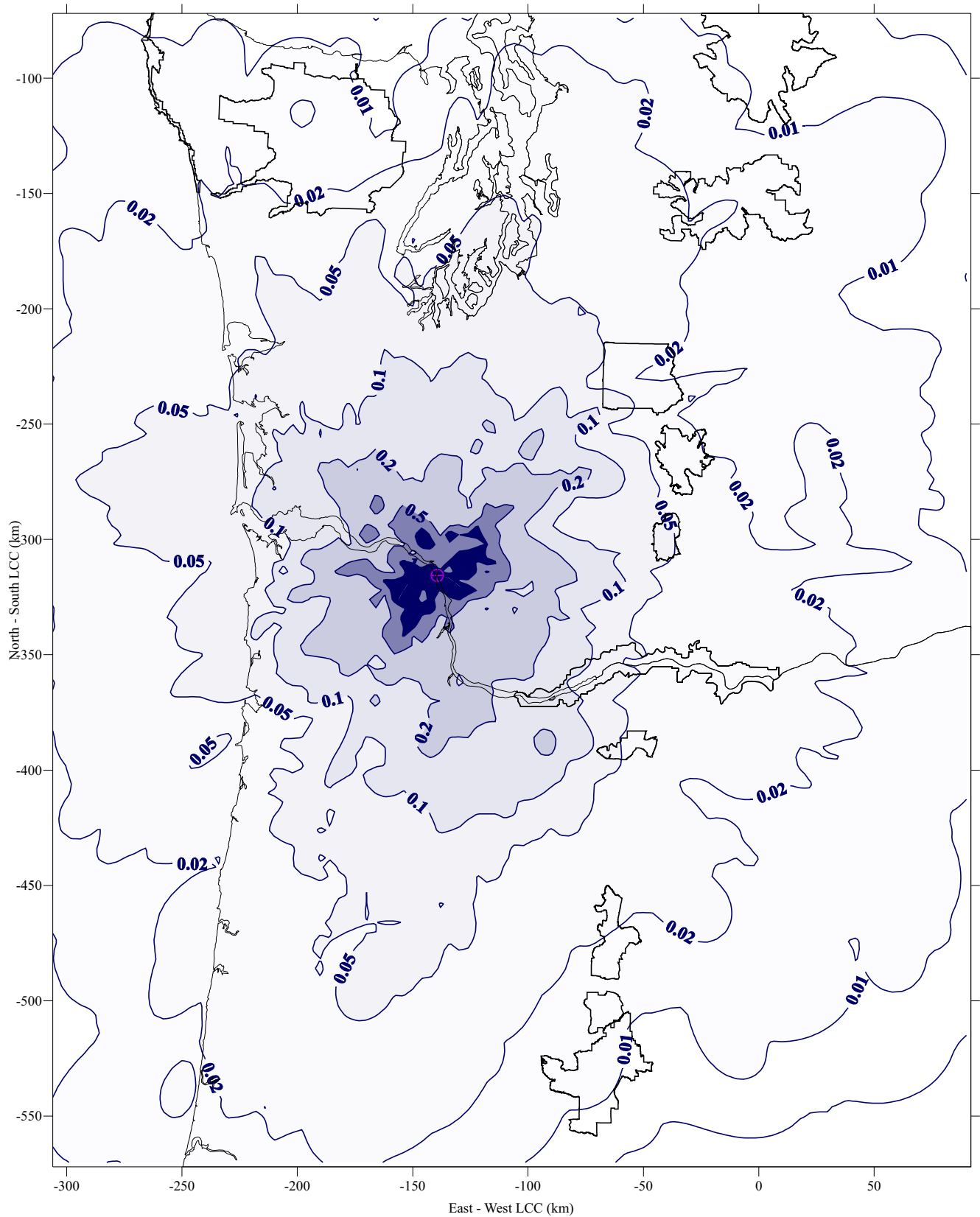


SOURCE: Geomatrix, 2006



Job No. 33758342

Figure 5.1-12
Maximum 24-Hour PM10 Concentrations ($\mu\text{g}/\text{m}^3$)
Includes Secondary Aerosols

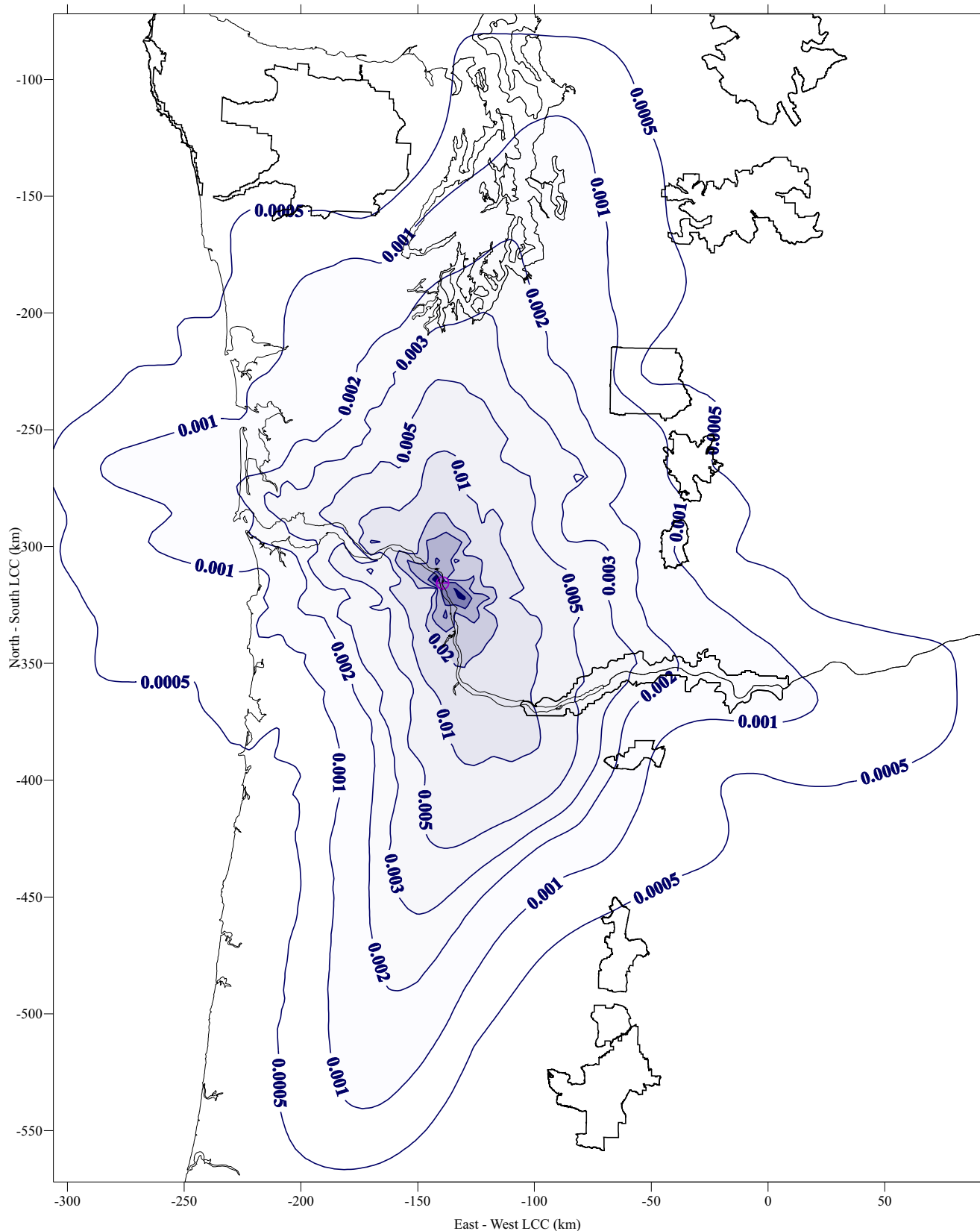


SOURCE: Geomatrix, 2006



Job No. 33758342

Figure 5.1-13
Maximum 3-Hour SO₂ Concentrations (µg/m³)



SOURCE: Geomatrix, 2006



Job No. 33758342

Figure 5.1-14
Maximum Annual NOx Concentrations ($\mu\text{g}/\text{m}^3$)

5.1.4.1.5.2 Nitrogen and Sulfur Deposition Fluxes

CALPUFF was applied to predict the impacts of acid-forming compounds emitted by the PMEC sources on soils, vegetation and aquatic resources in regional Class I areas. There are no standards for evaluation of these impacts to the AQRVs in Washington and Oregon. However, the NPS has established a Deposition Analysis Threshold (DAT) for nitrogen and sulfur of 0.005 kilograms per hectare per year (kg/ha/yr).¹⁷ This threshold is based on natural background deposition values culled from various research efforts, a variability factor, and a safety factor that accounts for cumulative effects. The nitrogen and sulfur DATs are not adverse impact thresholds, but are intended as conservative screening criteria that allow the FLMs to identify potential deposition fluxes that require their consideration on a case-by-case basis.

The results of the CALPUFF simulations for nitrogen and sulfur deposition are summarized in Table 5.1-39 where the maximum annual predictions for each Class I area and the CRGNSA are compared to the NPS nitrogen and sulfur DATs. Figure 5.1-15 and Figure 5.1-16 show the respective spatial variation of the maximum annual predicted sulfur and nitrogen deposition fluxes attributable to the PMEC over the entire simulation domain, respectively. General regional flow tends to direct plumes from the facility away from the Class I areas. Predicted annual deposition fluxes are highest within the Columbia River valley near the PMEC site with local maxima east of the PMEC site in complex terrain. The sulfur deposition patterns show a tendency towards slightly higher predictions east of the facility than indicated by the maximum annual nitrogen deposition fluxes.

The CRGNSA is the area of interest with the highest predicted nitrogen and sulfur deposition fluxes from the PMEC. Westerly flow aloft and large-scale terrain channeling are predicted to sometimes transport PMEC source plumes to the CRGNSA. However, predicted nitrogen and sulfur deposition fluxes within the CRGNSA are less than the NPS screening criteria (0.005 kg/ha/yr), suggesting the PMEC would not significantly affect ARQVs related to nitrogen or sulfur deposition.

¹⁷ Guidance on Nitrogen and Sulfur Deposition Analysis Thresholds, available on the FLAG internet site at <http://www2.nature.nps.gov/ard/flagfree/NSDATGuidance.htm>

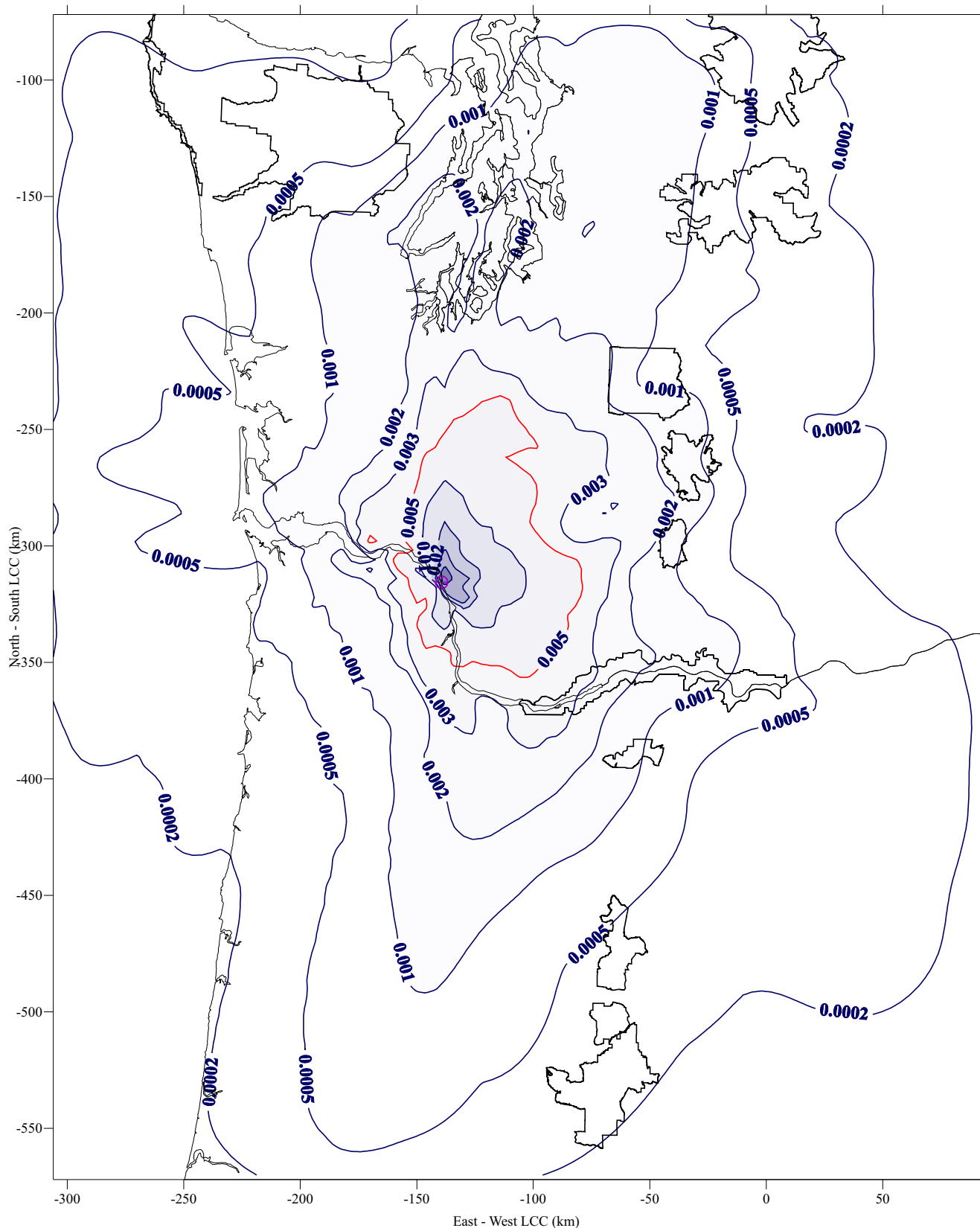
**TABLE 5.1-39
PREDICTED CLASS I AREA AND CRGNSA DEPOSITION FLUXS**

Deposition fluxes in kilograms per hectare per year (kg/ha/yr)

Class I Area of Interest	Nitrogen Deposition			Change in Nitrogen Deposition (%)	Sulfur Deposition			Change in Sulfur Deposition (%)
	Project	Background	Total		Project	Background	Total	
Alpine Lakes WA	0.0013	5.2	5.2013	0.03%	0.0014	7.2	7.2014	0.02%
CRGNSA ⁴	0.0032	10.0	10.0032	0.03%	0.0037	12.0	12.0037	0.03%
Glacier Peak WA	0.0008	5.8	5.8008	0.01%	0.0009	8.0	8.0009	0.01%
Goat Rocks WA	0.0016	9.0	9.0016	0.02%	0.0019	11.8	11.8019	0.02%
Mt. Adams WA	0.0017	9.0	9.0017	0.02%	0.0019	10.8	10.8019	0.02%
Mt. Hood WA	0.0014	5.4	5.4014	0.03%	0.0018	8.6	8.6018	0.02%
Mt. Jefferson WA	0.0005	1.8	1.8005	0.03%	0.0006	4.0	4.0006	0.01%
Mt. Rainier NP	0.0018	2.4	2.4018	0.08%	0.0022	3.1	3.1022	0.07%
Mt. Washington WA	0.0003	2.6	2.6003	0.01%	0.0004	5.0	5.0004	0.01%
Olympic NP	0.0010	2.0	2.0010	0.05%	0.0014	5.6	5.6014	0.03%
Three Sisters WA	0.0003	3.6	3.6003	0.01%	0.0004	5.6	5.6004	0.01%
<i>NPS DAT</i>	<i>0.005</i>				<i>0.005</i>			

Note:

¹ The CRGNSA is not a Class I area, but is included in the analysis at the request of Ecology and the FLMs.

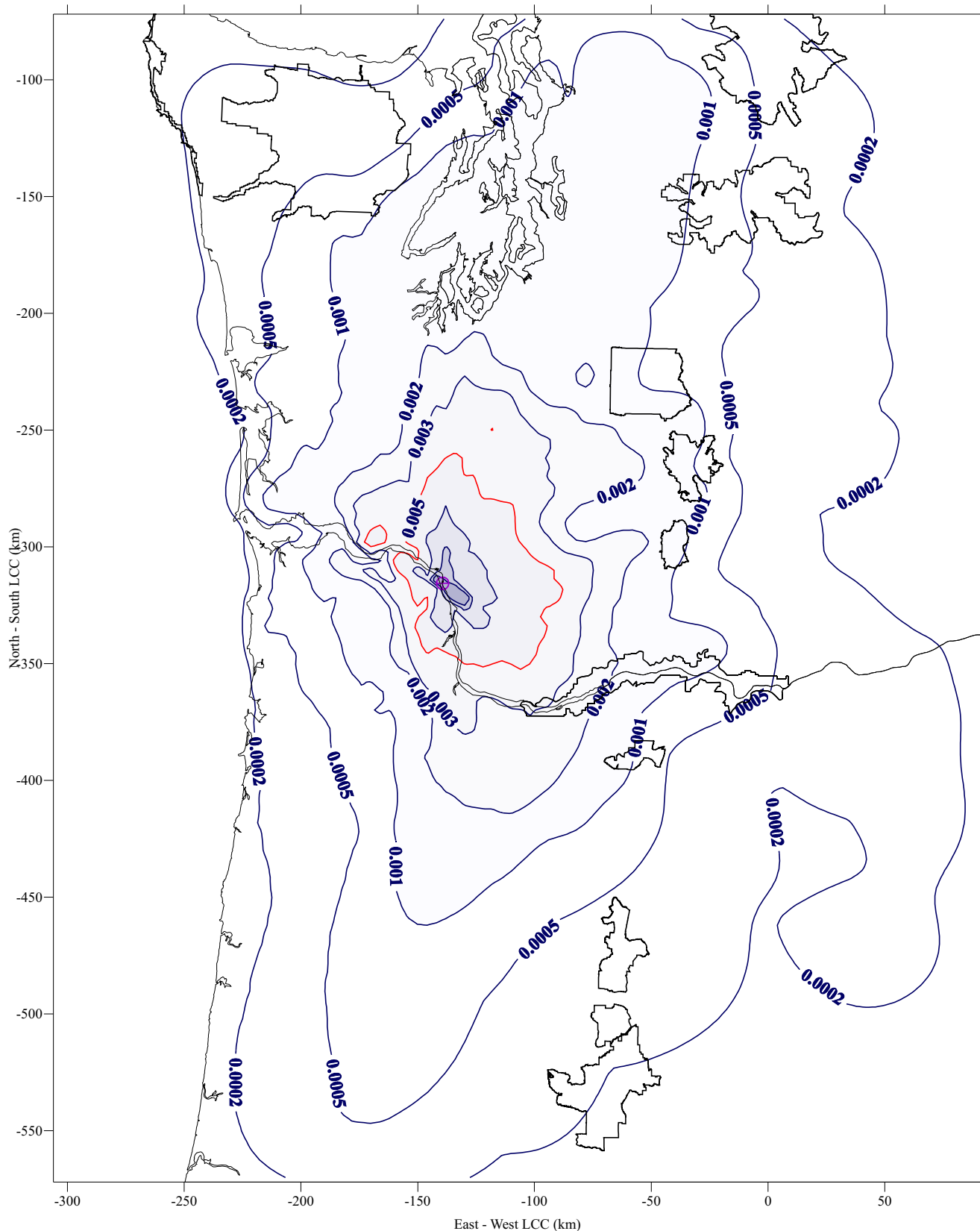


SOURCE: Geomatrix, 2006



Job No. 33758342

Figure 5.1-15
Maximum Annual Sulfur Deposition (kg/ha/yr)



SOURCE: Geomatrix, 2006



Job No. 33758342

Figure 5.1-16
Maximum Annual Nitrogen Deposition (kg/ha/yr)

5.1.4.1.5.3 Regional Haze

Compliance with the FLMs recommendations was assessed for regional visibility impacts by calculating the percent change in extinction for each Class I receptor. Using the conservative FLAG defaults recommended by the FLMs, the CALPUFF modeling system was applied to predict both the extinction coefficient attributable to emissions from the PMEC and the background extinction coefficients. Regional haze within the CRGNSA was assessed using the same methods, except that the background aerosol concentrations were based on measurements within the CRGNSA not the FLAG defaults representative of “natural” conditions.

The FLMs recommend in the FLAG Phase I Report that a five percent change in extinction be used to indicate a “just perceptible” change to a landscape. Sources that equal or exceed this threshold must perform a cumulative visibility analysis for PSD increment consuming sources. The threshold for the cumulative analysis is a ten percent change, and the threshold for the new source is a contribution of 0.4 percent of the change on those days.

The ten days with the highest maximum predicted changes in 24-hour extinction in three years are identified in Table 5.1-40. Table 5.1-41 lists the highest prediction in each Class I area and in the CRGNSA. The CRGNSA and Mt. Hood Wilderness Area are the areas predicted to have the highest potential changes to background extinction due to their close proximity to the source and because PMEC plumes are sometimes transported through the Gorge with westerly flow. The other areas of interest are less affected, with occasional higher predictions for the Class I areas in western Washington. The extinction budgets in Table 5.1-40 and Table 5.1-41 indicate nitrate and high relative humidity contribute to most to the extinction coefficients on the worst days. However, the sulfate and organic components also contribute to the extinction budget and sometimes have a combined effect greater than the nitrate aerosols.

Figure 5.1-17 shows contours of the maximum predicted 24-hour extinction in three years due to emissions from the PMEC sources. The highest 24-hour extinction coefficients occur close to the PMEC and are similar to predicted concentration patterns, aligned in a north-south direction with some indications of flow up the CRGNSA.

The FLMs recommend in the FLAG Phase I Report that a five percent change in extinction indicates a “just perceptible” change to a landscape. As shown in Table 5.1-40 and Table 5.1-41, the maximum predicted change in extinction to a Class I area based on three years of simulation on any day of the simulation was 4.34 percent in the Mt. Hood Wilderness Area, which is less than the five percent threshold established by the FLMs. The predicted maximum changes to extinction for the other Class I areas are typically much lower than the criterion. Based on the FLAG screening criterion, the CALPUFF simulations suggest PMEC emissions would not significantly degrade visibility in regional Class I areas.

TABLE 5.1-40
TEN DAYS WITH MAXIMUM PREDICTED CLASS I AREA AND CRGNSA EXTINCTION CHANGE

Extinction coefficient in inverse megameters (1/Mm)

Class I Area and CRGNSA	Date	b_{ext}^1			Change (%)	f(RH)	b_{ext} by Component ³					
		Project	Bckgrnd ²	Total			SO4	NO3	OC	EC	PMC	PMF
CRGNSA ⁴	02/27/03	2.08	30.83	32.91	6.73	6.86	0.441	1.256	0.183	0.186	0.000	0.008
CRGNSA ⁴	05/18/03	1.21	27.17	28.37	4.43	3.80	0.296	0.463	0.219	0.221	0.000	0.005
CRGNSA ⁴	03/16/04	1.16	26.62	27.77	4.35	3.57	0.206	0.554	0.195	0.197	0.000	0.006
Mt. Hood WA	04/04/04	0.69	15.80	16.48	4.34	5.16	0.144	0.367	0.087	0.087	0.000	0.001
Mt. Rainier NP	04/30/05	0.68	16.79	17.47	4.03	6.82	0.156	0.446	0.035	0.036	0.000	0.002
Mt. Hood WA	10/01/03	0.59	14.74	15.33	3.98	3.40	0.139	0.308	0.067	0.068	0.000	0.004
CRGNSA ⁴	04/06/04	1.06	27.08	28.14	3.91	3.77	0.234	0.446	0.188	0.189	0.000	0.003
CRGNSA ⁴	02/08/04	1.23	33.40	34.63	3.68	8.38	0.302	0.692	0.114	0.116	0.000	0.006
Mt. Hood WA	06/18/03	0.64	17.31	17.95	3.67	7.69	0.178	0.241	0.108	0.108	0.000	0.000
Mt. Adams WA	10/01/03	0.52	14.77	15.29	3.51	3.46	0.124	0.275	0.057	0.058	0.000	0.003

¹PMEC and background extinction values for daily period that resulted in the maximum percent change in extinction.

²Class I area background extinction derived from default annual average Western U.S. extinction components provided in FLAG guidance document and hourly relative humidity. CRGNSA background aerosol concentrations derived from observations on the 20 percent days with the lowest extinction.

³Extinction coefficient components are: SO4 = fine sulfate, NO3 = fine nitrate, OC = fine organic carbon, EC = fine elemental carbon, PMC = coarse mass, PMF = fine crustal mass.

⁴The Columbia River Gorge National Scenic Area is not a Class I area, but is included in the analysis at the request of Ecology and the FLMs.

TABLE 5.1-41
MAXIMUM PREDICTED EXTINCTION CHANGE BY CLASS I AREA AND CRGNSA

Extinction coefficient in inverse megameters (1/Mm)

Class I Area and CRGNSA	Date	b_{ext}^1			Change (%)	f(RH)	b_{ext} by Component ³					
		Project	Bckgrnd ²	Total			SO4	NO3	OC	EC	PMC	PMF
Alpine Lakes WA	11/09/04	0.513	15.581	16.094	3.290	4.801	0.106	0.298	0.053	0.053	0.000	0.003
CRGNSA ⁴	02/27/03	2.075	30.830	32.905	6.730	6.858	0.441	1.256	0.183	0.186	0.000	0.008
Glacier Peak WA	11/09/04	0.249	15.361	15.610	1.620	4.436	0.054	0.139	0.027	0.027	0.000	0.001
Goat Rocks WA	02/28/03	0.431	17.789	18.220	2.420	8.482	0.105	0.229	0.048	0.048	0.000	0.000
Mt. Adams WA	10/01/03	0.518	14.773	15.291	3.510	3.455	0.124	0.275	0.057	0.058	0.000	0.003
Mt. Hood WA	04/04/04	0.686	15.796	16.482	4.340	5.160	0.144	0.367	0.087	0.087	0.000	0.001
Mt. Jefferson WA	06/23/04	0.287	14.146	14.434	2.030	2.411	0.048	0.091	0.073	0.074	0.000	0.002
Mt. Rainier NP	04/30/05	0.676	16.793	17.469	4.030	6.821	0.156	0.446	0.035	0.036	0.000	0.002
Mt. Washington WA	03/09/04	0.294	16.664	16.958	1.760	6.607	0.073	0.178	0.020	0.021	0.000	0.001
Olympic NP	01/20/04	0.318	16.187	16.504	1.960	5.811	0.063	0.182	0.035	0.036	0.000	0.001
Three Sisters WA	10/02/03	0.350	15.342	15.692	2.280	4.404	0.080	0.175	0.046	0.047	0.000	0.002

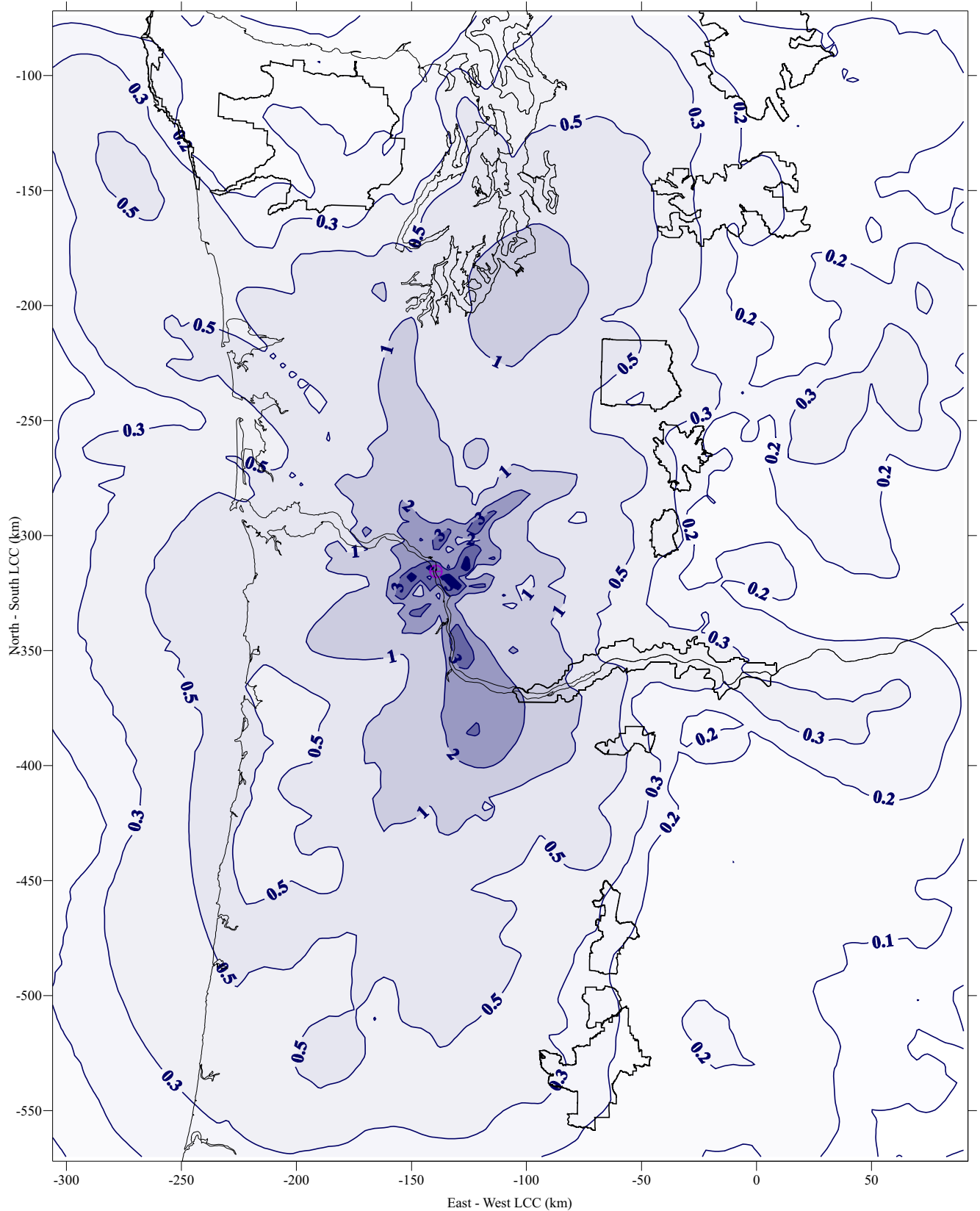
Notes:

¹PMEC and background extinction values for daily period that resulted in the maximum percent change in extinction.

²Class I area background extinction derived from default annual average Western U.S. extinction components provided in FLAG guidance document and hourly relative humidity. CRGNSA background aerosol concentrations derived from observations on the 20 percent days with the lowest extinction.

³Extinction coefficient components are: SO4 = fine sulfate, NO3 = fine nitrate, OC = fine organic carbon, EC = fine elemental carbon, PMC = coarse mass, PMF = fine crustal mass.

⁴The CRGNSA is not a Class I area, but is included in the analysis at the request of Ecology and the FLMs.



SOURCE: Geomatrix, 2006



Geomatrix

Job No. 33758342

Figure 5.1-17
Maximum 24-Hour Extinction (1/Mm) Excluding Background

Figure 5.1-18 presents a contour plot of the predicted change to extinction caused by emissions attributable to the PMEC on the day predicted to experience the maximum change in extinction (February 27, 2003) in the CRGNSA.¹⁸ This day was the only 24-hour period in three years predicted where the CRGNSA exceeded the five percent FLM criterion for Class I areas. Light winds were prevalent throughout the day, with seasonably cool temperatures and high humidity. The evening/early morning hours were 100 percent overcast followed by clearing in the late morning. The cool temperatures and high humidity contributes to nitrate formation and stagnation persisted throughout most of the day.

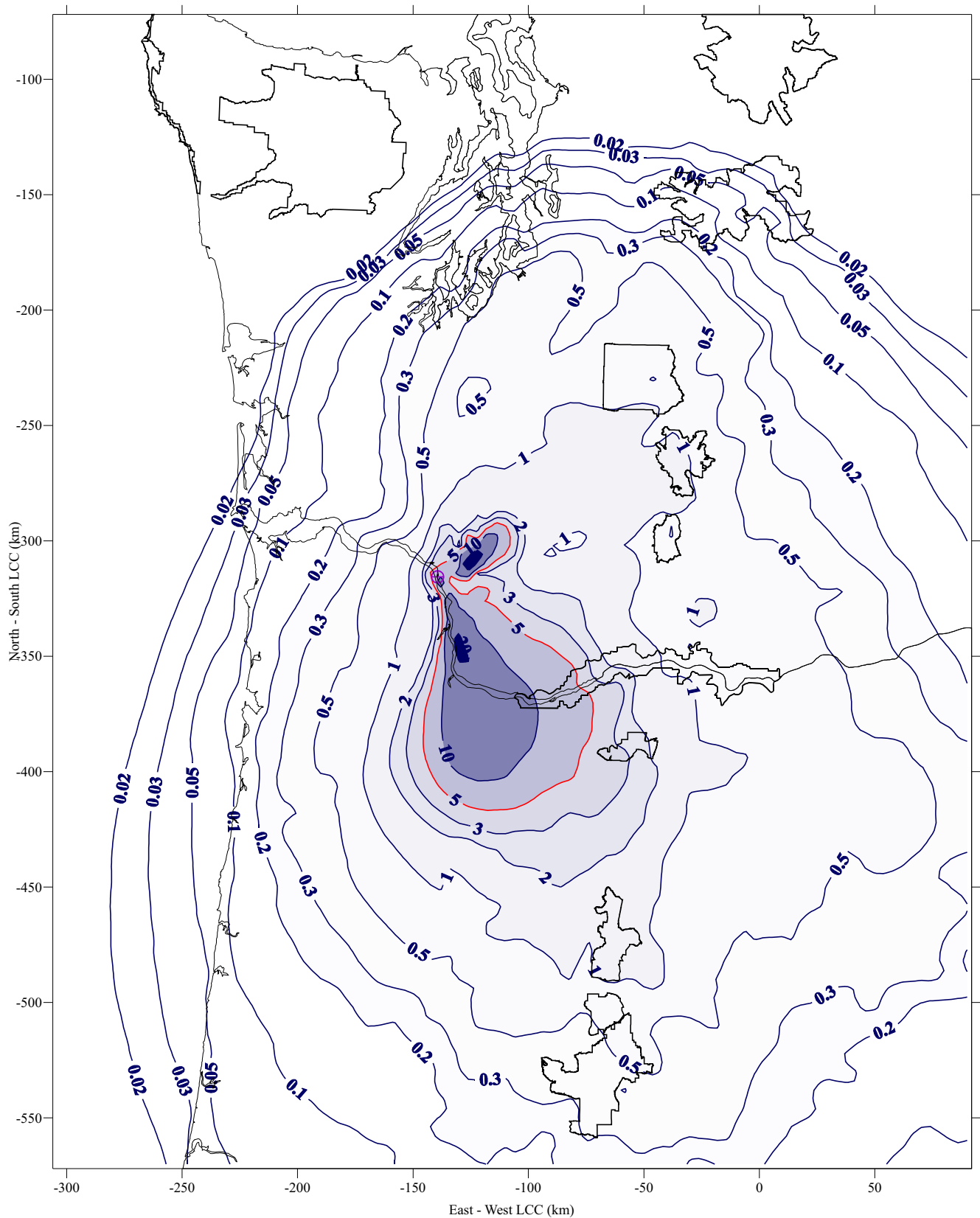
Although the predicted change to extinction in a small portion of the CRGNSA exceeds the FLM criteria of five percent on a single day in three years, increased emissions from the PMEC are not expected to significantly degrade visibility due to the inherent conservatism in the approach. Some of these conservatisms are as follows:

- The modeling procedures for background extinction assume low aerosol concentrations and excellent visibility. They do not consider weather obscuration often associated with high relative humidity and cold temperature in the Pacific Northwest. On February 27, 2003 stations in the Portland area reported 100 percent cloud cover, low ceiling heights, for many hours within the 24-hour period.
- The extinction budgets shown in Table 5.1-39 and Table 5.1-40 indicate that sulfate aerosols are responsible for the significant portions of extinction on the worst days. A portion of the sulfate aerosol is the result of the sulfate in the PM_{2.5} directly emitted by the turbines. The analysis “double counts” the sulfur emitted by the turbines because SO₂ emissions have not been reduced to account for the sulfate in the PM_{2.5} emitted.
- Figure 5.1-18 shows the extinction predicted for February 27, 2003. Note, the project’s plume only affects a small corner of the CRGNSA and the change to extinction is not uniform or representative of a long optical path length. The FLM criteria are based on the assumption that the change to extinction is representative of “regional haze” across lines of sight that are close to the visual range. The standard visual range prediction for this day is 120 km, much longer than any reasonable line of site within the CRGNSA affected by the PMEC’s plume on this day.
- High relative humidity on February 27, 2003 increased the scattering efficiencies of the hygroscopic aerosols. The humidity adjustment factor was 6.86 as shown in Table 5.1-39. It has been common practice for Class I assessments in Washington state to use predicted hourly relative humidity to calculate the extinction coefficient. However, the FLMs allow the use of seasonal relative humidity adjustment factors to estimate background natural visibility.^{8,14} These seasonal factors remove some of the effects of high humidity caused by weather obscuring events. For example, the winter season humidity adjustment factor associated with the background extinction used in the CRGNSA (Table 5.1-36) is 3.97, much lower than 6.86 used in the

¹⁸ The contour plot in Figure 5.1-18 was prepared from the results at gridded receptor locations. In order to prepare a plot for the entire domain, it was necessary to select a single set of background aerosol concentrations. The changes to extinction in this figure are based on the FLAG western US defaults

calculation on February 27, 2003. When the FLM recommended seasonal factors are applied to the days shown in Table 5.1-39, all the predicted changes to extinction in the CRGNSA are less than the five percent criterion.

PMEC emissions are not expected to significantly degrade visibility in CRGNSA or any Class I area.



SOURCE: Geomatrix, 2006



Job No. 33758342

Figure 5.1-18
**Change to 24-Hour Extinction (%) from "Natural" Background
 on February 27, 2003**

5.2

WAC 463-60-537 Wastewater/storm water discharge permit applications.

The application for site certification shall include:

- (1) A completed National Pollutant Discharge Elimination System (NPDES) permit application, for any proposed discharge to surface waters of the state of Washington, pursuant to the requirements of WAC 463-76-031; or*
- (2) For any proposed discharge to publicly owned treatment works (POTW) and/or ground water of the state of Washington, a state waste discharge application;*
- (3) A notice of intent to be covered under any applicable statewide general permit for storm water discharge.*

[04-23-003, recodified as § 463-60-537, filed 11/4/04, effective 11/11/04. Statutory Authority: RCW 80.50.040 (1) and (12). 04-21-013, § 463-42-537, filed 10/11/04, effective 11/11/04.]

SECTION 5.2 WASTEWATER AND STORMWATER DISCHARGE PERMIT APPLICATION (WAC 463-60-537)

5.2.1 WASTEWATER DISCHARGE

The Pacific Mountain Energy Center (PMEC) will need a federal National Pollutant Discharge Elimination System (NPDES) permit for wastewater discharges to the Columbia River. It is planned to discharge PMEC's industrial wastewater to the mixing vault for the combined domestic and industrial wastewater system of the Port of Kalama (Figure 2-7.3), and thence to the Port's outfall to the Columbia River. PMEC is required to comply with any pre-treatment requirements to ensure that the terms of the Port of Kalama's NPDES permit are not violated.

A water balance diagram is shown on the following page as Figure 5.2-1.

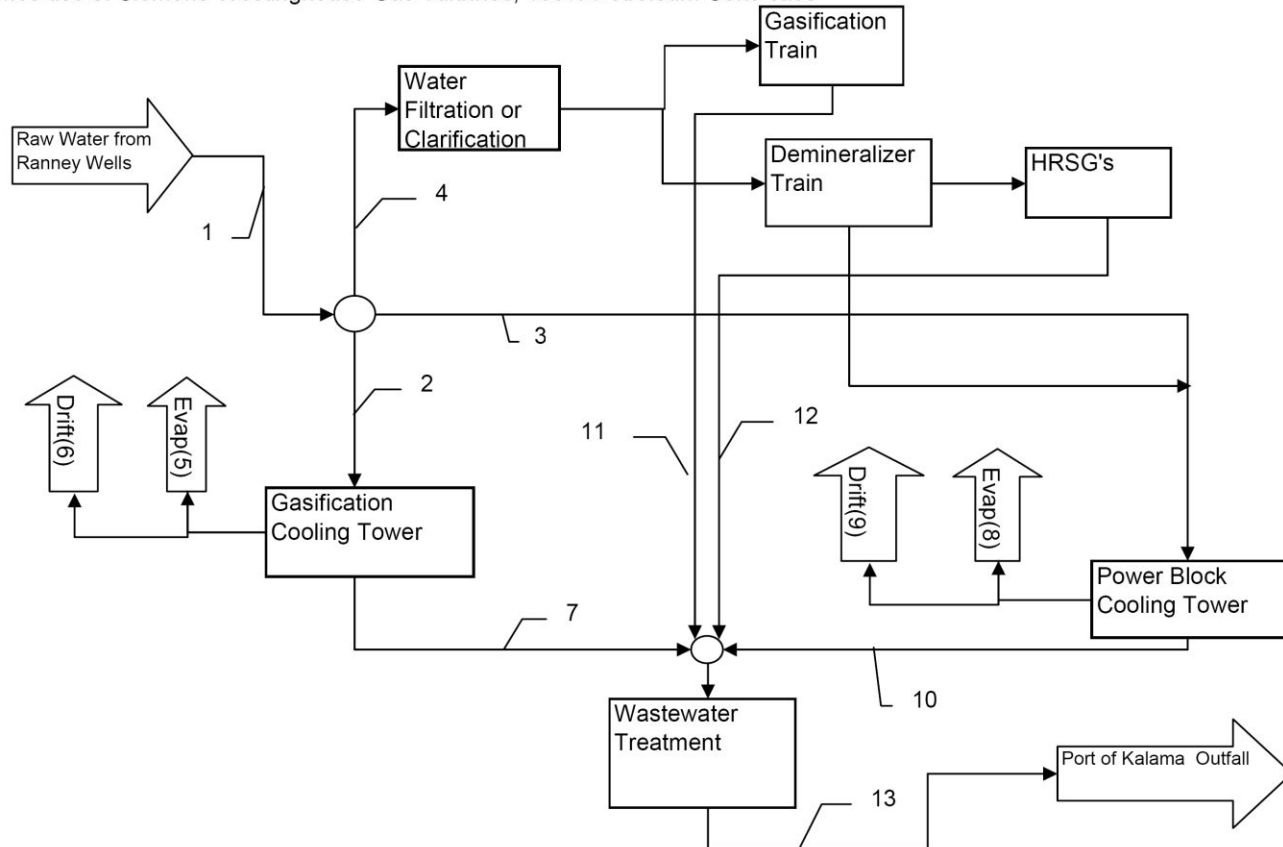
In order to comply with the EPA Consolidated Permits Program, the following forms are expected to be needed: Form 1 (General Information), Form 2D (Discharge to Surface Waters), and Form 5 (Stationary Air Pollution Source). Forms 1 and 2D have been initially completed and are included in this application. Form 5, which are currently under revision by the EPA and not available on their website, will be added when available.

5.2.2 STORMWATER DISCHARGE

Coverage for stormwater discharges will be sought under the State of Washington Stormwater Industrial Stormwater General Permit. The application will include submitting a Notice-of-Intent (NOI) form to be covered under this permit, and preparing the required public notices of such intent. The application will be filed approximately 90 days prior to the start of operation.

Energy Northwest Pacific Mountain Energy Center IGCC Plant

Assumes use of Siemens-Westinghouse Gas Turbines, 100% Petroleum Coke case



Number	1	2	3	4	5	6	7	8	9	10	11	12	13
Description	Raw water from Ranney Wells	Gasification Cooling Tower Makeup	Power Block Cooling Tower Makeup	Process Water Inlet	Evaporation from Gasification Cooling Tower	Drift from Gasification Cooling Tower	Blowdown from Gasification Cooling Tower	Evaporation from Power Block Cooling Tower	Drift from Power Block Cooling Tower	Blowdown from Power Block Cooling Tower	Gasifier Blowdown	HRSG Blowdown	Wastewater to Outfall
Flow (gpm)	5260	1204	3524	532	963	32 (high)	209 (high)	2819	94 (high)	611 (high)	70	XX (low)	890 (high)
TDS (mg/L)					0			0					
Temp (°F)													

Figure 5.2-1

Water Balance

FORM <div style="font-size: 2em; font-weight: bold;">1</div> GENERAL		U.S. ENVIRONMENTAL PROTECTION AGENCY <div style="font-size: 1.2em; font-weight: bold;">GENERAL INFORMATION</div> <i>Consolidated Permits Program</i> <i>(Read the "General Instructions" before starting.)</i>	I. EPA I.D. NUMBER <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td style="width:5%;">S</td> <td style="width:15%;"></td> <td style="width:5%;">T/A</td> <td style="width:5%;">C</td> </tr> <tr> <td>F</td> <td></td> <td></td> <td>D</td> </tr> <tr> <td>1</td> <td>2</td> <td>13</td> <td>14</td> </tr> <tr> <td></td> <td></td> <td></td> <td>15</td> </tr> </table>	S		T/A	C	F			D	1	2	13	14				15
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LABEL ITEMS <div style="border: 1px solid black; padding: 5px; margin-top: 5px;"> I. EPA I.D. NUMBER III. FACILITY NAME V. FACILITY MAILING LIST VI. FACILITY LOCATION </div>		PLEASE PLACE LABEL IN THIS SPACE																	
II. POLLUTANT CHARACTERISTICS INSTRUCTIONS: Complete A through J to determine whether you need to submit any permit application forms to the EPA. If you answer "yes" to any questions, you must submit this form and the supplemental form listed in the parenthesis following the question. Mark "X" in the box in the third column if the supplemental form is attached. If you answer "no" to each question, you need not submit any of these forms. You may answer "no" if your activity is excluded from permit requirements; see Section C of the instructions. See also, Section D of the instructions for definitions of bold-faced terms.																			
SPECIFIC QUESTIONS		SPECIFIC QUESTIONS																	
MARK "X"		MARK "X"																	
<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td style="width:33%;">YES</td> <td style="width:33%;">NO</td> <td style="width:33%;">FORM ATTACHED</td> </tr> </table>		YES	NO	FORM ATTACHED	<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td style="width:33%;">YES</td> <td style="width:33%;">NO</td> <td style="width:33%;">FORM ATTACHED</td> </tr> </table>		YES	NO	FORM ATTACHED										
YES	NO	FORM ATTACHED																	
YES	NO	FORM ATTACHED																	
A. Is this facility a publicly owned treatment works which results in a discharge to waters of the U.S.? (FORM 2A)		B. Does or will this facility (either existing or proposed) include a concentrated animal feeding operation or aquatic animal production facility which results in a discharge to waters of the U.S.? (FORM 2B)																	
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C. Is this facility which currently results in discharges to waters of the U.S. other than those described in A or B above? (FORM 2C)		D. Is this proposal facility (other than those described in A or B above) which will result in a discharge to waters of the U.S.? (FORM 2D)																	
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25	26	27																	
E. Does or will this facility treat, store, or dispose of hazardous wastes? (FORM 3)		F. Do you or will you inject at this facility industrial or municipal effluent below the lowermost stratum containing, within one quarter mile of the well bore, underground sources of drinking water? (FORM 4)																	
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G. Do you or will you inject at this facility any produced water other fluids which are brought to the surface in connection with conventional oil or natural gas production, inject fluids used for enhanced recovery of oil or natural gas, or inject fluids for storage of liquid hydrocarbons? (FORM 4)		H. Do you or will you inject at this facility fluids for special processes such as mining of sulfur by the Frasch process, solution mining of minerals, in situ combustion of fossil fuel, or recovery of geothermal energy? (FORM 4)																	
<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td><input type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td>34</td> <td>35</td> <td>36</td> </tr> </table>		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	34	35	36	<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td><input type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td>37</td> <td>38</td> <td>39</td> </tr> </table>		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	37	38	39				
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37	38	39																	
I. Is this facility a proposed stationary source which is one of the 28 industrial categories listed in the instructions and which will potentially emit 100 tons per year of any air pollutant regulated under the Clean Air Act and may affect or be located in an attainment area? (FORM 5)		J. Is this facility a proposed stationary source which is NOT one of the 28 industrial categories listed in the instructions and which will potentially emit 250 tons per year of any air pollutant regulated under the Clean Air Act and may affect or be located in an attainment area? (FORM 5)																	
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III. NAME OF FACILITY																			
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C	SKIP	Pacific Mountain Energy Center (PMEC)																	
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IV. FACILITY CONTACT																			
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V. FACILITY MAILING ADDRESS																			
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VI. FACILITY LOCATION																			
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C. CITY OR TOWN	D. STATE	E. ZIP CODE	F. COUNTY CODE																
Kalama	WA																		
40	41, 42	47, 51	52, 54																

VII. SIC CODES (4-digit, in order of priority)

A. FIRST				B. SECOND			
C	7	15	16	17	7	15	16
4911	(specify)	Electric Services			(specify)		
C. THIRD				D. FOURTH			
C	7	15	16	17	7	15	16
	(specify)				(specify)		

VIII. OPERATOR INFORMATION

A. NAME				B. Is the name listed in Item VIII-A also the owner?			
C	8	18	19	<input checked="" type="checkbox"/> YES <input checked="" type="checkbox"/> NO			
Energy Northwest							
C. STATUS OF OPERATOR (Enter the appropriate letter into the answer box; if "Other," specify.)				D. PHONE (area code & no.)			
F = FEDERAL	M = PUBLIC (other than federal or state)	S = STATE	O = OTHER (specify)	C	A	15	16
P = PRIVATE				360	673	3350	
M (specify)							

E. STREET OR PO BOX				F. CITY OR TOWN				G. STATE		H. ZIP CODE		IX. INDIAN LAND	
P.O. Box 1960				Kalama		WA		98625		Is the facility located on Indian lands?		<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	

X. EXISTING ENVIRONMENTAL PERMITS

A. NPDES (Discharges to Surface Water)				D. PSD (Air Emissions from Proposed Sources)			
C	T	I	9	C	T	I	9
WA0040843 (Port of Kalama, adjacent to proposed facility)				P			
B. UIC (Underground Injection of Fluids)				E. OTHER (specify)			
C	T	I	9	C	T	I	9
U							
C. RCRA (Hazardous Wastes)				E. OTHER (specify)			
C	T	I	9	C	T	I	9
R							

XI. MAP

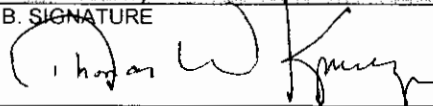
Attach to this application a topographic map of the area extending to at least one mile beyond property boundaries. The map must show the outline of the facility, the location of each of its existing and proposed intake and discharge structures, each of its hazardous waste treatment, storage, or disposal facilities, and each well where it injects fluids underground. Include all springs, rivers and other surface water bodies in the map area. See instructions for precise requirements.

XII. NATURE OF BUSINESS (provide a brief description)

Energy Northwest is proposing to construct and operate the Pacific Mountain Energy Center (PMEC), an Integrated Gasification Combined Cycle (IGCC) development, which will gasify petroleum coke or coal to power two 300 MW combined cycle combustion turbine electric power generating plants. In the gasification process, petroleum coke, coal, or blends of coal and petroleum coke are pulverized and transported into a pressurized vessel (the gasifier) along with sub-stoichiometric amounts of purified oxygen. In the gasifier, controlled reactions take place, thermally converting feed stock materials into a low British Thermal Unit (BTU) gaseous fuel known as synthesis gas or syngas. The syngas is cooled, cleaned of contaminants, and then combusted in a combustion turbine, which is directly connected to an electric generator. The electric power generating plants have two sources of power generation – a combustion turbine-generator (CTG) and a steam turbine-generator (STG). The expansion of hot combustion gases inside the combustion turbine creates rotational energy that spins the generator and produces electricity. The hot exhaust gases exiting the CTG pass through a heat recovery steam generator (HRSG), a type of boiler where steam is produced. The resulting steam is piped to a steam turbine that is connected to an electric generator. The expansion of steam inside the steam turbine spins the generator to produce an additional source of electricity. The gasification process is integrated with the combined cycle electric power generating plant to improve efficiencies and optimize performance. The combined complex is known as IGCC, an inherently lower polluting technology application to produce electricity from solid feed stocks. Additionally, the PMEC will have the capability of using natural gas as a back up fuel for the electric power generating plants.

XIII. CERTIFICATION (see instructions)

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this application and all attachments and that, based on my inquiry of those persons immediately responsible for obtaining the information contained in the application, I believe that the information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

A. NAME & OFFICIAL TITLE (type or print)		B. SIGNATURE	C. DATE SIGNED
Thomas Krueger, Project Manager, Generation Project Development			8/31/06
COMMENTS FOR OFFICIAL USE ONLY			

B. Attach a line drawing showing the water flow through the facility. Indicate sources of intake water, operations contributing wastewater to the effluent, and treatment units labeled to correspond to the more detailed descriptions in Item III-A. Construct a water balance on the line drawing by showing average flows between intakes, operations, treatment units, and outfalls. If a water balance cannot be determined (e.g., for certain mining activities), provide a pictorial description of the nature and amount of any sources of water and any collection or treatment measures.

C. Except for storm runoff, leaks, or spills, will any of the discharges described in Item III-A be intermittent or seasonal?

☐ Yes (complete the following table)

☒ No (go to Item IV)

Outfall Number	1. Frequency		2. Flow		
	a. Days Per Week (specify average)	b. Months Per Year (specify average)	a. Maximum Daily Flow Rate (in mgd)	b. Maximum Total Volume (specify with units)	c. Duration (in days)
N/A					

IV. Production

If there is an applicable production-based effluent guideline or NSPS, for each outfall list the estimated level of production (projection of actual production level, not designed), expressed in the terms and units used in the applicable effluent guideline or NSPS, for each of the first 3 years of operation. If production is likely to vary, you may also submit alternative estimates (attach a separate sheet).

Year	a. Quantity Per Day	b. Units of Measure	c. Operation, Product, Material, etc (specify)
N/A			N/A
N/A			N/A
N/A			N/A

CONTINUED FROM THE FRONT		EPA ID Number (cop from Item 1 of Form 1)	Outfall Number 1
V. Effluent Characteristics			
<p>A and B: These items require you to report estimated amounts (<i>both concentration and mass</i>) of the pollutants to be discharged from each of your outfalls. Each part of this item addresses a different set of pollutants and should be completed in accordance with the specific instruction for that part. Data for each outfall should be on a separate page. Attach additional sheets of paper if necessary.</p> <p>General Instructions (See Table 2D-2 for Pollutants)</p> <p>Each part of this item requests you to provide an estimated daily maximum and average for certain pollutants and the source of information. Data for all pollutants in Group A, for all outfalls, must be submitted unless waived by the permitting authority. For all outfalls, data for pollutants in Group B should be reported only for pollutants which you believe will be present or are limited directly by an effluent limitations guideline or NSPS or indirectly through limitations on an indicator pollutant.</p>			
1. Pollutant	2. Maximum Daily Value (include units)	3. Average Daily Value (include units)	4. Source (see instructions)
BOD			All values based solely on raw water concentrated 12 times (i.e. cooling tower blowdown).
COD			
TOC			
TSS			
NH3 (as N)			
Temp (Winter / Summer)	Winter: TBD	Summer: TBD	
pH		6.3	
Silica (as SiO2)		132 ppmw	
Iron		156 ppmw	
Manganese		24 ppmw	
Calcium		492 ppmw	
Magnesium		168 ppmw	
Sodium		108 ppmw	
Potassium		12 ppmw	
Carbonate		2.4 ppmw	
Bicarbonate		720 ppmw	
Sulfate		30 ppmw	
Chloride		30 ppmw	
Fluoride		3.6 ppmw	
Nitrate		3.6 ppmw	
Mercury		0.006 ppmw	
Selenium		0.12 ppmw	
Arsenic		0.06 ppmw	
Lead		0.012 ppmw	
Zinc		0.072 ppmw	
Silver		0.012 ppmw	
Hardness (as CaCO3)		1920 ppmw	

VII. Other Information (Optional)

Use the space below to expand upon any of the above questions or to bring to the attention of the reviewer any other information you feel should be considered in establishing permit limitations for the proposed facility. Attach additional sheets if necessary.

VIII. Certification

I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

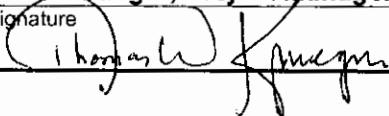
A. Name and Official Title (type or print)

Thomas Krueger, Project Manager, Generation Project Development

B. Phone No.

(509) 377-4761

C. Signature



D. Date Signed

8/31/06